United States
Department of
Agriculture

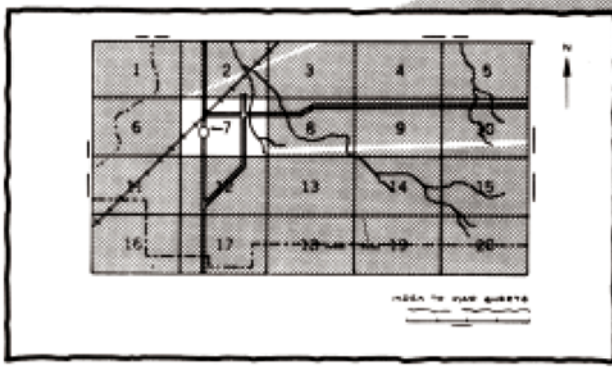
Soil
Conservation
Service

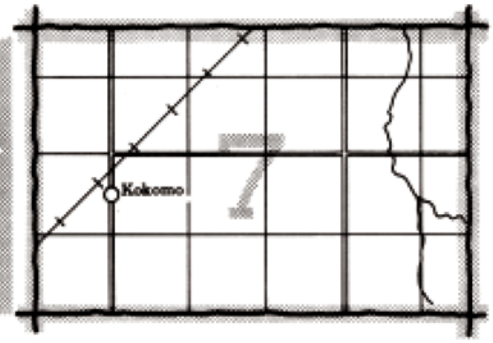
In cooperation with
Purdue University
Agricultural Experiment
Station and the
Indiana Department of
Natural Resources,
Soil and Water
Conservation Committee

Soil Survey of Adams County, Indiana

HOW TO USE

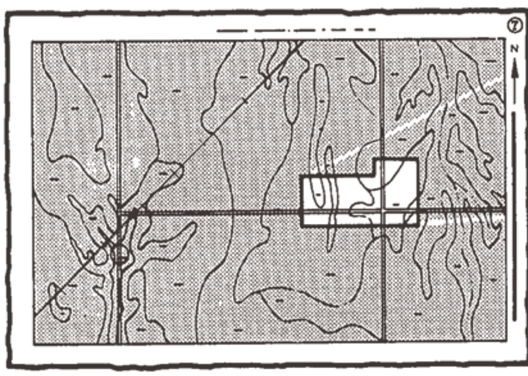
1. Locate your area of interest on the "Index to Map Sheets"

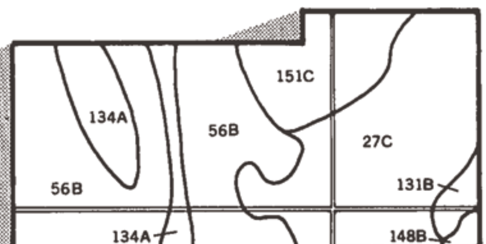




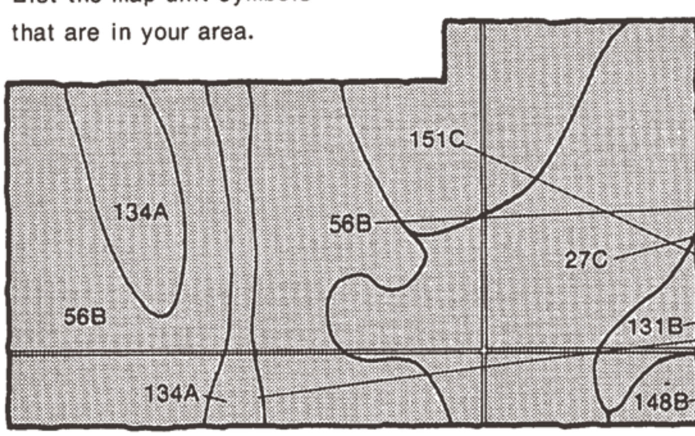
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area.



Symbols

27C
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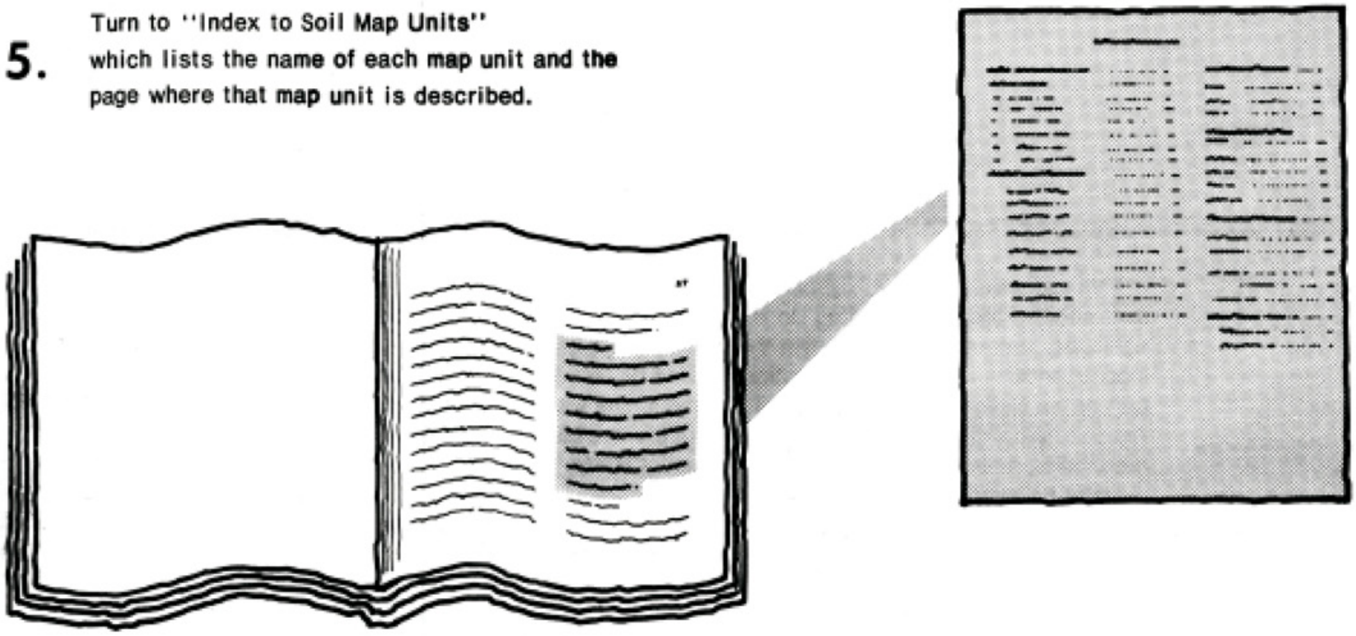
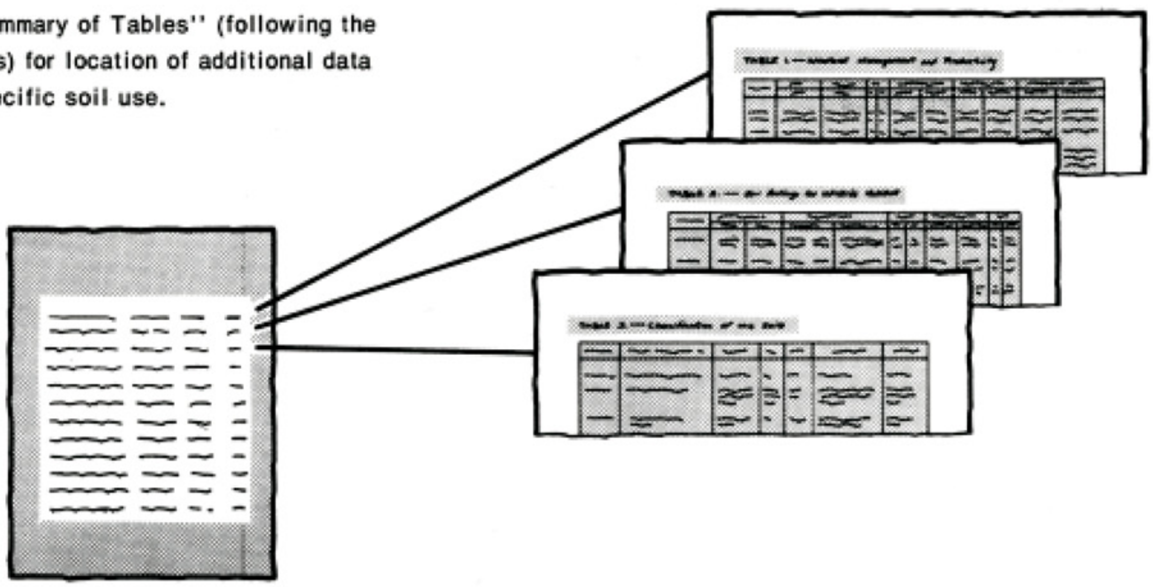
151C

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Adams County Soil and Water Conservation District. Financial assistance was made available by the Board of County Commissioners of Adams County.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Shocked oats in an area of Blount silt loam, 0 to 1 percent slopes.

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Issued March 1986

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Foreword

This soil survey contains information that can be used in land-planning programs in Adams County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Robert L. Eddleman

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State Conservationist
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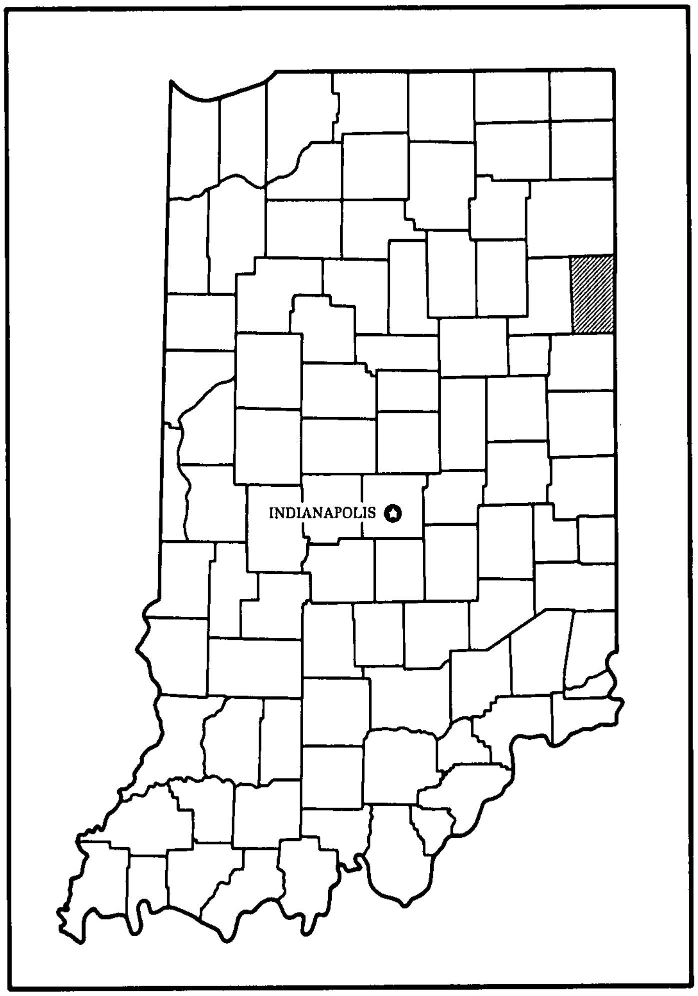

Location of Adams County in Indiana.

Soil Survey of Adams County, Indiana

By Denver L. Farmer, Soil Conservation Service, and
Thomas R. Ziegler, Indiana Department of Natural Resources

Fieldwork by Denver L. Farmer and Charles E. Froehle,
Soil Conservation Service, and
Thomas R. Ziegler and Virginia A. Meyer,
Indiana Department of Natural Resources

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
Purdue University Agricultural Experiment Station and the
Indiana Department of Natural Resources,
Soil and Water Conservation Committee

General Nature of the County

ADAMS COUNTY is in northeastern Indiana. It has an area of 217,555 acres, or 340 square miles. Decatur is the county seat and the largest community in the county. It is about 90 miles northeast of Indianapolis. Other towns of importance are Berne, Monroe, and Geneva.

The population of Adams County was approximately 21,840 in 1910. It increased to about 26,871 by 1970. The population density is 78 people per square mile. A population of 36,000 is anticipated by 1995.

Adams County is a nearly level or gently sloping glacial till plain dissected by the St. Mary's and Wabash Rivers and their tributaries. Low relief and a few abrupt changes characterize the physiography of the area. The elevation ranges from about 900 feet above sea level at a point north of the Wabash River in section 15 of Wabash Township to about 750 feet on the St. Mary's River at the Allen County line.

The St. Mary's River and the Wabash River flow across the county from southeast to northwest. The St. Mary's River drains most of the northern part of the county and flows into the Maumee River, which discharges into Lake Erie. The Wabash River drains much of the southern part of the county and eventually flows into the Ohio River.

Ground water is the main source of water in Adams County. The two largest communities, Decatur and Berne, depend on ground water from wells in glacial drift. Other potential sources of water are reservoirs and wells drilled into limestone bedrock.

Most people in Adams County make their living from farming or work at factories in local towns or in nearby Fort Wayne. Most of the county is actively farmed. Corn, soybeans, and wheat are the principal crops. Vegetable crops are grown to a lesser extent.

Adams County is served by three railroads. There are 115 miles of federal and state highways and 703 miles of county roads. Most roads are paved, but many of the county roads have a gravel surface. The one small airport has a grass runway.

Urban development is proceeding at a faster rate around Decatur and Berne than around the other communities.

This survey updates the soil survey of Adams County that was published in 1923(*3*). It provides additional information and larger maps, which show the soils in greater detail.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Adams County is cold in winter but quite hot in summer. Winter precipitation, frequently snow, provides a good accumulation of soil moisture by spring and minimizes drought during summer on most soils. The normal annual precipitation is adequate for all crops that are suited to this area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Berne, Indiana, in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 28 degrees F, and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at Berne on January 24, 1963, is -18 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on September 2, 1953, is 101 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 36 inches. Of this, 21 inches, or nearly 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.88 inches at Berne on September 20, 1957. Thunderstorms occur on about 40 days each year, and most occur in summer. Tornadoes and severe thunderstorms occur occasionally. These storms are usually local in extent and of short duration. They cause damage in a variable pattern.

The average seasonal snowfall is about 29 inches. The greatest snow depth at any one time during the period of record was 14 inches. On the average, 17 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, specialty crops, woodland, urban uses,* and *recreation areas*. Cultivated crops are those grown extensively in the survey area. Specialty crops are the vegetables and fruits that generally require intensive management. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas are those used for nature study and those used as wilderness.

The names, descriptions, and delineations of the soils identified on the general soil map of this survey area do not always agree or join fully with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the map units.

1. Blount-Pewamo

Deep, nearly level, somewhat poorly drained and very poorly drained, silty and clayey soils on till plains and moraines

These nearly level soils are on till plains and moraines that include depressional areas. Slopes range from 0 to 2 percent.

This map unit makes up about 73 percent of the county. It is about 50 percent Blount soils, 40 percent Pewamo soils, and 10 percent minor soils (fig. 1).

The Blount soils are in nearly level and slightly raised areas. They are somewhat poorly drained. Typically, they have a surface layer of dark grayish brown silt loam. The subsoil is dark grayish brown and dark brown, mottled silty clay loam and silty clay in the upper part and dark grayish brown and grayish brown, mottled clay and silty clay loam in the lower part.

The Pewamo soils are in nearly level depressions. They are very poorly drained. Typically, they have a surface layer of very dark grayish brown silty clay. The subsoil is gray and dark brown, mottled silty clay.

The minor soils include the moderately well drained Glynwood soils on the steeper ridges and the very poorly drained, depressional Milford soils on lake plains. Milford soils contain less gravel than the major soils.

The soils in this unit are used mostly for cultivated crops. Some areas are used for hay or pasture, and a few are wooded. Wetness is the main limitation on most of the soils, but most areas have been adequately drained.

Most of the soils in this unit have good potential for cultivated crops. They have poor potential for residential and other urban uses because of slow or moderately slow permeability and wetness.

2. Glynwood-Blount

Deep, nearly level and gently sloping, moderately well drained and somewhat poorly drained, silty soils on till plains

These soils are on undulating till plains that include plane and depressional areas. Slopes range from 0 to 8 percent.

This map unit makes up about 15 percent of the county. It is about 38 percent Glynwood soils, 37 percent Blount soils, and 25 percent minor soils (fig. 2).

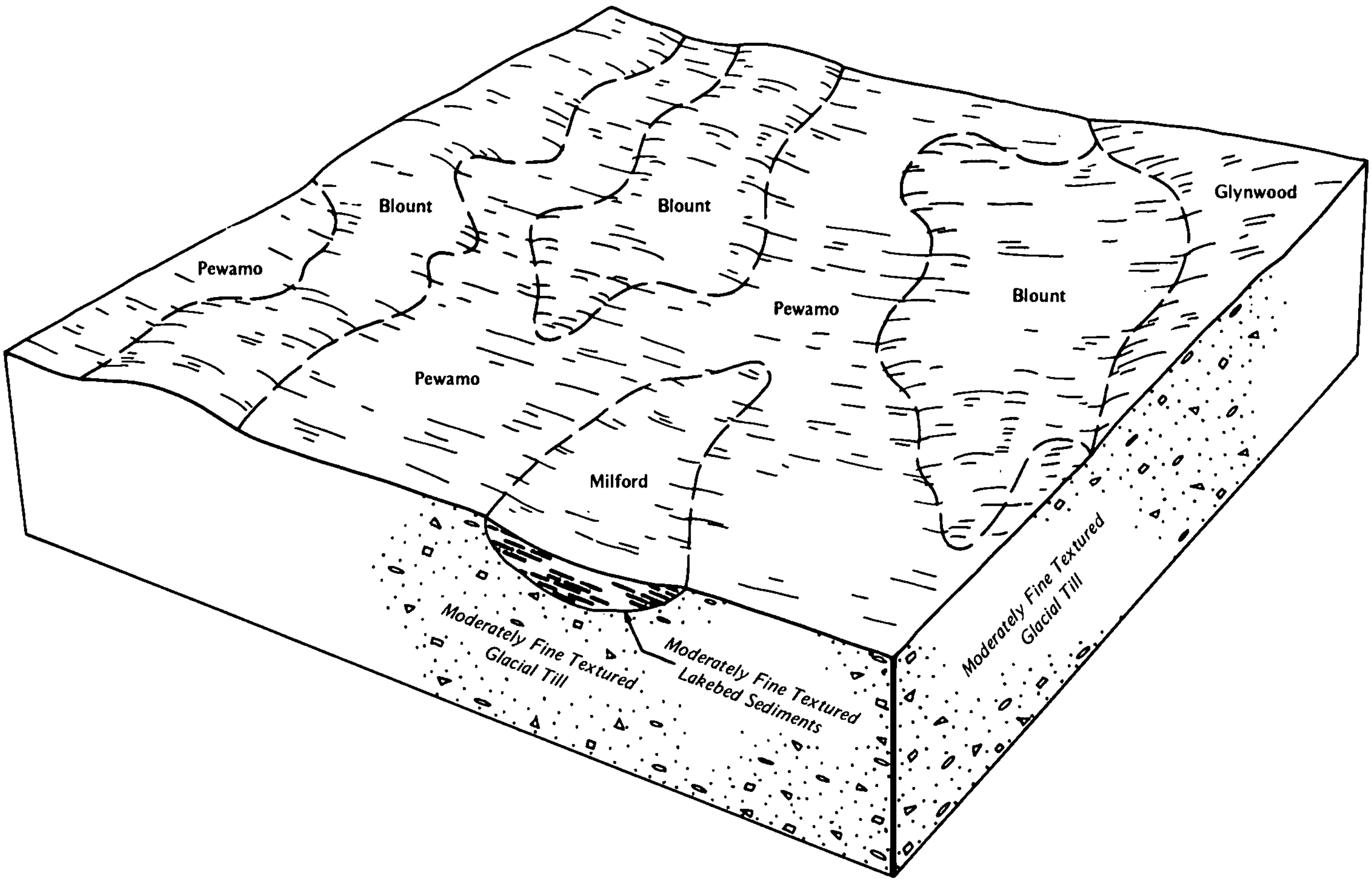

Figure 1.—Pattern of soils and parent material in the Blount-Pewamo map unit.

The gently sloping Glynwood soils are on broad ridges. They are moderately well drained. Typically, they have a surface layer of dark grayish brown silt loam. The subsoil is dark yellowish brown clay in the upper part and dark yellowish brown, mottled clay loam in the lower part.

The nearly level and gently sloping Blount soils are on foot slopes and in the lower lying areas. They are somewhat poorly drained. Typically, they have a surface layer of dark grayish brown silt loam. The subsoil is dark grayish brown and dark brown, mottled silty clay and silty clay loam in the upper part and dark grayish brown and grayish brown, mottled clay and silty clay loam in the lower part.

The minor soils include the very poorly drained Pewamo soils in depressions and along broad drainageways; the somewhat poorly drained, Haskins soils in plane areas northeast of the larger streams; and the moderately well drained Rawson soils in the steeper areas. Haskins soils are sandier than the major soils.

The soils in this unit are used mostly for cultivated crops. Some areas are wooded. Erosion is the main hazard in the steeper areas. Wetness is the main limitation in the more nearly level and depressional areas. Most areas that require drainage have been adequately drained.

Most of the soils in this unit have good potential for cultivated crops. They have poor potential for residential and other urban uses because of slow permeability and wetness.

3. Saranac-Tice-Sloan

Deep, nearly level, very poorly drained and somewhat poorly drained, clayey, silty, and loamy soils on bottom lands

These soils are on plane or depressional bottom lands that are subject to frequent flooding. Slopes range from 0 to 2 percent.

This unit makes up about 7 percent of the county. It is about 25 percent Saranac soils, 15 percent Tice soils, 7 percent Sloan soils, and 53 percent minor soils.

The Saranac soils are in depressions. They are very poorly drained. Typically, they have a surface layer of very dark grayish brown clay. The subsoil is very dark gray and dark gray, mottled clay.

The Tice soils are in the slightly higher areas. They are somewhat poorly drained. Typically, they have a surface layer of very dark grayish brown silty clay loam. The subsoil is dark brown and brown, mottled silty clay loam in the upper part and dark yellowish brown, mottled clay loam in the lower part.

The Sloan soils are in depressions. They are very poorly drained. Typically, they have a surface layer of very dark grayish brown loam. The subsoil is dark gray, mottled clay loam in the upper part and gray, mottled clay loam and sandy clay loam in the lower part.

The minor soils include the well drained Armiesburg and Chagrin soils on bottom lands; the very poorly drained Milford soils in depressions on the adjacent terraces; the somewhat poorly drained Shoals soils on bottom lands; the somewhat poorly drained Whitaker soils on slight rises on the adjacent terraces that are not flooded; and the well drained Martinsville soils on the adjacent terraces. Milford soils are subject to ponding. Shoals soils are sandier than the major soils.

The soils in this unit are used mostly for cultivated crops. Some areas are used for grasses and legumes, and some are wooded. Flooding is the main hazard on the bottom lands. Wetness also is a limitation in the low lying areas. Most areas that could be drained economically have been adequately drained.

Because of flooding and wetness, most of the soils in this unit have only fair potential for cultivated crops and poor potential for residential and other urban uses.

4. Nappanee-St. Clair

Deep, nearly level and gently sloping, somewhat poorly drained and moderately well drained, silty and loamy soils on till plains and moraines

These soils are on undulating till plains and moraines that include plane and depressional areas. Slopes range from 0 to 8 percent.

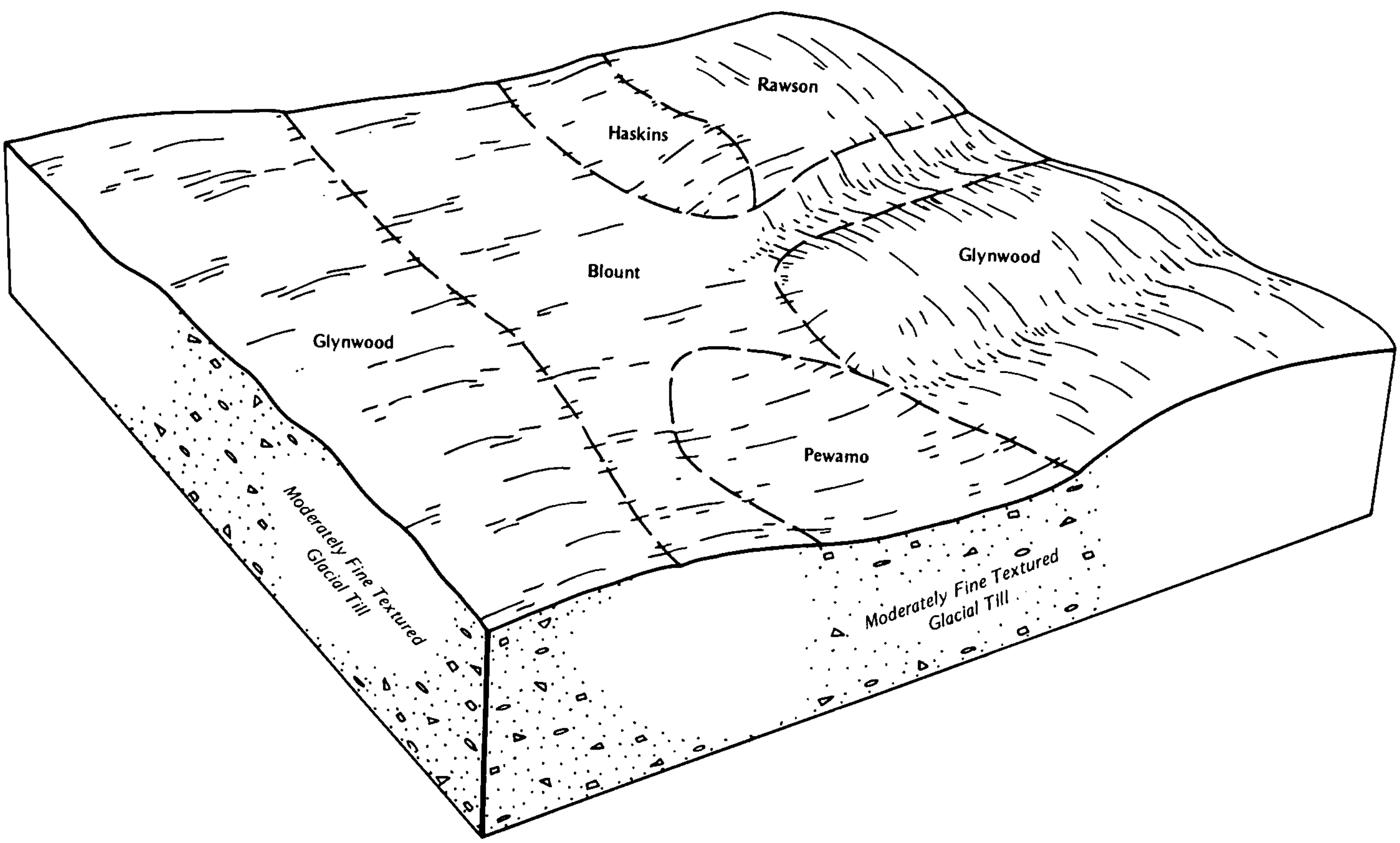

Figure 2.—Pattern of soils and parent material in the Glynwood-Blount map unit.

This map unit makes up about 5 percent of the county. It is about 40 percent Nappanee soils, 17 percent St. Clair soils, and 43 percent minor soils.

The Nappanee soils are in nearly level areas. They are somewhat poorly drained. Typically, they have a surface layer of dark grayish brown silt loam. The subsoil is light brownish gray, mottled silty clay loam in the upper part and dark yellowish brown, mottled clay in the lower part.

The gently sloping St. Clair soils are on broad ridges. They are moderately well drained. Typically, they have a surface layer of dark grayish brown clay loam. The subsoil is brown clay in the upper part and dark yellowish brown, mottled clay and silty clay in the lower part.

The minor soils include the very poorly drained Pewamo soils in depressions and along broad drainageways; the somewhat poorly drained Haskins soils in plane areas northeast of the larger streams; the moderately well drained Rawson soils in the steeper areas, generally adjacent to Haskins soils; and the well drained Morley soils in the more sloping areas. Haskins and Rawson soils contain less clay in the subsoil than the major soils.

The soils in this unit are used mostly for cultivated crops. Some areas are wooded. Erosion is the main hazard in the steeper areas. Wetness is the main limitation in the plane and depressional areas. Most areas that require drainage have been adequately drained.

Most of the soils in this unit have only fair potential for cultivated crops because of the slope and the erosion hazard. They have poor potential for residential and other urban uses because of wetness, slow permeability, and a high shrink-swell potential.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Martinsville loam, 2 to 6 percent slopes, is one of several phases in the Martinsville series.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

The names, descriptions, and delineations of the soils identified on the detailed soil maps of this survey area do not always agree or join fully with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the map units.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Am—Armiesburg silty clay loam, frequently flooded. This deep, nearly level, well drained soil is on bottom lands. It is frequently flooded for brief periods by overflow from streams. Most areas are elongated and are 3 to 50 acres in size.

In a typical profile, the surface layer is very dark grayish brown silty clay loam about 11 inches thick. The subsurface layer also is very dark grayish brown silty clay loam. It is about 9 inches thick. The subsoil is dark brown and dark yellowish brown, friable silty clay loam about 24 inches thick. The substratum to a depth of 60 inches is brown silty clay loam. In some areas the surface layer is not dark. In a few small areas the surface soil and subsoil have more sand throughout. In a few places the subsoil contains less clay.

Included with this soil in mapping are a few small areas of the very poorly drained Saranac soils and the somewhat poorly drained Tice soils. These soils are in the lower landscape positions. They make up about 8 percent of the unit.

Available water capacity is high in the Armiesburg soil. Permeability is moderate. Organic matter content also is moderate. Surface runoff is slow. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Nearly all areas of this soil are used for cultivated crops. Only a few areas are used for hay or pasture. A few small areas are wooded.

This soil is well suited to corn and soybeans. The flooding is the major hazard, and some damage can be expected during the cropping season. Levees can be constructed to prevent flooding. Conservation tillage,

which leaves all or part of the crop residue on the surface, and cover crops help to maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses and most legumes for hay or pasture, but it is poorly suited to deep-rooted legumes, such as alfalfa, because of the flooding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

Because the flooding is a severe hazard, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of flooding, frost action, and low strength. Elevating the roadbed on suitable fill and installing culverts improve the ability of the road to support traffic and help to prevent the damage caused by flooding and frost action.

The land capability classification is IIw. The woodland ordination symbol is 1a.

BcA—Blount silt loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is in slightly raised areas on till plains. Areas are irregular in shape and are 3 to 350 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 30 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam and silty clay; the next part is dark brown, mottled, very firm silty clay; and the lower part is dark grayish brown and grayish brown, mottled, very firm clay and silty clay loam. The substratum to a depth of 60 inches is grayish brown, mottled clay loam. In some areas the slope is more than 1 percent.

Included with this soil in mapping are a few small areas of the moderately well drained Glynwood soils on slope breaks and in the higher landscape positions and small areas of the very poorly drained Pewamo soils in depressions. Included soils make up about 8 percent of the unit.

Available water capacity is moderate in the Blount soil. Permeability is slow. Organic matter content is moderate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet for a significant part of the year. The surface layer may crust after rains, so that young seedlings, especially soybeans, have difficulty emerging.

Nearly all areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few small areas are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation (fig. 3). It can be reduced by subsurface drains. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to maintain and improve organic matter content and soil tilth.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. Where the soil is not drained, it is not so well suited to deep-rooted legumes, such as alfalfa. The major management concerns are overgrazing and grazing when the soil is wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is fairly well suited to trees. The main management concerns are seedling mortality and the windthrow hazard. Using special planting stock and overstocking help to overcome severe seedling mortality. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard.

Because of the wetness, this soil is severely limited as a site for dwellings. An adequate drainage system around the foundation lowers the water table. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Drainage ditches help to prevent the damage caused by frost action. Replacing or strengthening the base material improves the ability of the road to support traffic. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. A subsurface perimeter drainage system reduces the wetness. The slowly permeable material can be replaced by more permeable material.

The land capability classification is IIw. The woodland ordination symbol is 3c.

BcB—Blount silt loam, 1 to 4 percent slopes. This deep, gently sloping, somewhat poorly drained soil is along drainageways and on swells on till plains. Areas are irregular in shape and are 3 to 200 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 19 inches thick. It is yellowish brown and dark yellowish brown, mottled, very firm clay and silty clay loam. The substratum to a depth of 60 inches is dark yellowish brown, mottled silty clay loam. In some areas the slope is less than 1 percent.

Included with this soil in mapping are a few small areas of severely eroded soils that have a silty clay loam surface layer. Also included are small areas of the moderately well drained Glynwood soils on breaks along drainageways and small areas of the very poorly drained Pewamo soils in depressions and drainageways. Included soils make up about 5 to 10 percent of the unit.

Figure 3.—Corn in an area of Blount silt loam, 0 to 1 percent slopes. On the included Pewamo soils in depressions, the crop has been severely damaged by ponding.

Available water capacity is moderate in the Blount soil. Permeability is slow. Organic matter content is moderate. Surface runoff is medium. The water table is at a depth of 1 to 3 feet for a significant part of the year. The surface layer may crust after rains, so that young seedlings, especially soybeans, have difficulty emerging.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few are wooded.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Crop rotations that include grasses and legumes, terraces, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Subsurface drains remove excess ground water. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to control erosion and maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses and shallow-rooted legumes for hay or pasture (fig. 4). Where the soil is not drained, it is not so well suited to deep-rooted legumes, such as alfalfa. The major management concerns are overgrazing and grazing when the soil is wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is fairly well suited to trees. The main management concerns are seedling mortality and the windthrow hazard. Using special planting stock and overstocking help to overcome severe seedling mortality. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard.

Because of the wetness, this soil is severely limited as a site for dwellings. An adequate subsurface drainage

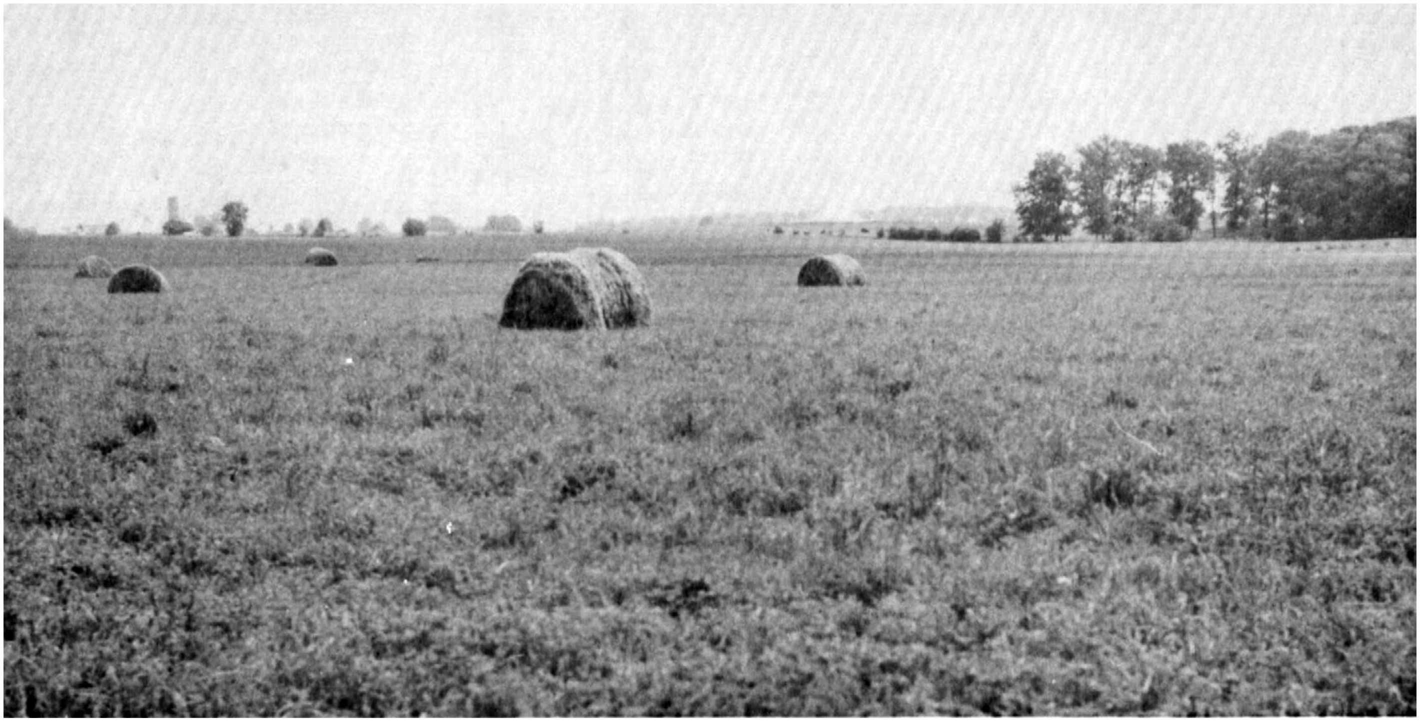

Figure 4.—Hay in an area of Blount silt loam, 1 to 4 percent slopes.

system around the foundation lowers the water table. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Drainage ditches help to prevent the damage caused by frost action. Replacing or strengthening the base material improves the ability of the road to support traffic. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. A subsurface perimeter drainage system reduces the wetness. The slowly permeable material can be replaced by more permeable material.

The land capability classification is unit IIe. The woodland ordination symbol is 3c.

Ch—Chagrin loam, frequently flooded. This deep, nearly level, well drained soil is on bottom lands. It is frequently flooded for brief periods by overflow from streams. Areas are generally elongated and are 2 to 30 acres in size.

In a typical profile, the surface layer is dark brown loam about 10 inches thick. The subsoil is about 35 inches thick. It is dark brown, friable loam in the upper part; dark yellowish brown, firm sandy clay loam in the next part; and dark yellowish brown, firm sandy loam in the lower part. The substratum to a depth of 60 inches is dark grayish brown loamy fine sand. In some areas the surface layer is fine sandy loam. In places the surface layer and subsoil are strongly acid.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Shoals soils. These soils are in the slightly lower landscape positions. They make up about 8 percent of the unit.

Available water capacity is high in the Chagrin soil. Permeability is moderate. Organic matter content also is moderate. Surface runoff is slow. The water table is at a depth of 4 to 6 feet for a significant part of the year. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Nearly all areas of this soil are used for cultivated crops. Only a few areas are used for hay or pasture. A few small areas are wooded.

This soil is well suited to corn and soybeans. The flooding is the major hazard, and some damage can be expected during the cropping season. Levees can be constructed to prevent flooding. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to maintain or improve organic matter content and soil tilth.

This soil is well suited to most grasses and legumes for hay or pasture, but it is poorly suited to deep-rooted legumes, such as alfalfa, because of the flooding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates,

pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

Because the flooding is a severe hazard, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. The flooding also is a severe hazard on sites for local roads and streets. Elevating the roadbed on suitable fill and installing culverts make the road passable during floods and improve its ability to support traffic.

The land capability classification is IIw. The woodland ordination symbol is 1a.

GoB—Glynwood silt loam, 3 to 8 percent slopes. This deep, gently sloping, moderately well drained soil is on ridges and knolls on till plains. Areas are irregular in shape and are 2 to 50 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 26 inches thick. The upper part is dark yellowish brown, firm clay, and the lower part is dark yellowish brown, mottled, very firm clay loam. The substratum to a depth of 60 inches is dark brown silty clay loam. In a few small areas the upper part of the soil is loam.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Blount soils in the lower landscape positions and a few small areas of the well drained Morley soils on slope breaks. Also included are small areas of severely eroded soils that have a silty clay loam or clay loam surface layer. Included soils make up 10 to 15 percent of the unit.

Available water capacity is moderate in the Glynwood soil. Permeability is slow. Organic matter content is moderate. Surface runoff is medium. The water table is at a depth of 2.0 to 3.5 feet for a significant part of the year. The surface layer may crust after rains, so that young seedlings, especially soybeans, have difficulty emerging.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few are wooded.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown (fig. 5). Crop rotations that include grasses and legumes, terraces, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to control erosion and maintain or improve organic matter content and soil tilth. Subsurface drains are needed to remove water from seepy areas in some of the drainageways and swales.

This soil is well suited to grasses and legumes for hay or pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is fairly well suited to trees. The main management concerns are seedling mortality, the windthrow hazard, and plant competition. Using special planting stock and overstocking help to overcome seedling mortality. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard. Special harvesting methods and site preparation may be needed to control plant competition.

Because of the shrink-swell potential and the wetness, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. Reinforcing foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. An adequate subsurface drainage system is needed to lower the water table. The soil is severely limited as a site for local roads and streets because of low strength and frost action. Drainage ditches help to prevent the damage caused by frost action. Replacing or strengthening the base material improves the ability of the road to support traffic. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. A subsurface perimeter drainage system reduces the wetness. The slowly permeable material can be replaced by more permeable material.

The land capability classification is IIe. The woodland ordination symbol is 2c.

HaA—Haskins loam, 1 to 3 percent slopes. This deep, nearly level, somewhat poorly drained soil is in slightly raised areas on till plains and moraines. Areas are irregular in shape and are 3 to 30 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 9 inches thick. The subsoil is about 18 inches thick. The upper part is yellowish brown, mottled, friable loam, and the lower part is dark grayish brown and yellowish brown, mottled, firm clay loam. The substratum to a depth of 60 inches is grayish brown and brown, mottled, firm and very firm clay loam. In some areas the surface layer is sandy loam or fine sandy loam. In a few small areas the surface layer and subsoil are more clayey.

Included with this soil in mapping are a few small areas of the very poorly drained Pewamo soils in the lower landscape positions. Also included are small areas of the moderately well drained Rawson soils in the higher landscape positions and a few small areas of

Figure 5.—A rock chute in a sloping drainageway in an area of Glynwood silt loam, 3 to 8 percent slopes. The cover of rocks helps to control erosion.

severely eroded soils. Included soils make up about 8 percent of the unit.

Available water capacity is moderate in the Haskins soil. Permeability is moderate in the surface layer and subsoil and slow in the substratum. Organic matter content is moderate. Surface runoff is slow. The water table is at a depth of 1.0 to 2.5 feet for a significant part of the year. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Nearly all areas of this soil are used for cultivated crops. Only a few areas are used for hay or pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. It can be reduced by subsurface drains. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to maintain or improve organic matter content and soil tilth.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. Where the soil is not drained, it is not so well suited to deep-rooted legumes, such as alfalfa. The major management concerns are overgrazing and grazing when the soil is wet. Grazing under wet conditions causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

Because of the wetness, this soil is severely limited as a site for dwellings. An adequate subsurface drainage system is needed to lower the water table. The soil is severely limited as a site for local roads and streets because of frost action. Drainage ditches and culverts help to prevent the damage caused by frost action. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. A subsurface perimeter drainage system reduces the wetness. The slowly permeable material can be replaced by more permeable material.

The land capability classification is IIw. The woodland ordination symbol is 2a.

Ho—Houghton muck, drained. This deep, nearly level, very poorly drained soil is in depressions on till plains and moraines. It is frequently ponded by runoff from the higher lying adjacent slopes. Areas are generally long or oval and are 2 to 100 acres in size.

In a typical profile, the surface layer is black muck about 9 inches thick. The next layer to a depth of 60 inches also is black muck. In some areas the soil is underlain by marl, clay loam, or sandy loam.

Included with this soil in mapping are a few small areas of Milford and Montgomery soils in the slightly higher landscape positions. These soils are not organic. They make up 4 to 8 percent of the unit.

Available water capacity is very high in the Houghton soil. Permeability is moderately slow to moderately rapid. Organic matter content is very high. Surface runoff is very slow or ponded. The water table is at or above the surface for a significant part of the year. The organic material subsides during dry periods.

Most areas of this soil are used for cultivated crops. Some are used for pasture or are idle.

This soil is best suited to specialty crops, such as mint or vegetables, that are not easily damaged by frost. Crops for silage also can be grown. Crops on this soil are subject to killing frosts earlier in fall and later in spring than those on other soils in this county. Only crops that are not affected by this limitation can be grown. The wetness also is a major limitation. An adequate drainage system is needed. After the soil is drained, soil blowing is a severe hazard. It can be controlled by planting a cover crop, such as rye or wheat, beside the crop rows.

If adequately drained, this soil is fairly well suited to grasses, such as reed canarygrass, and to shallow-rooted legumes. It is less well suited to deep-rooted legumes, such as alfalfa. Grazing when the soil is wet is the major management concern. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods keep the pasture and soil in good condition.

This soil is poorly suited to trees. The equipment limitation, the windthrow hazard, seedling mortality, and plant competition are the main management concerns. Heavy equipment can be used only during dry periods or when the soil is frozen because of the poor stability of the muck. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard. Using special planting stock and overstocking help to overcome seedling mortality. Site preparation may be needed to control plant competition.

Because ponding and low strength are severe limitations, this soil is generally unsuitable as a site for dwellings. Because the ponding and the moderately slow permeability are severe limitations, the soil is generally unsuitable as a site for septic tank absorption fields. It is severely limited as a site for local roads and streets because of low strength, ponding, and frost action. Constructing the road on raised, well compacted fill, establishing adequate side ditches, and installing culverts help to overcome these limitations.

The land capability classification is IIIw. The woodland ordination symbol is 4w.

McA—Martinsville loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on terraces. Areas are irregular in shape and are 2 to 40 acres in size.

In a typical profile, the surface layer is brown loam about 10 inches thick. The subsoil is about 55 inches thick. It is, in sequence downward, dark reddish brown, firm loam and clay loam; dark reddish brown, friable sandy clay loam; dark brown, loose sandy loam; and dark reddish brown and dark yellowish brown gravelly sandy clay loam and loam. The substratum to a depth of 80 inches is yellowish brown gravelly sandy loam. In some areas the surface layer and subsoil are less clayey.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Whitaker soils. These soils are in the slightly lower landscape positions. They make up 2 to 8 percent of the unit.

Available water capacity is moderate in the Martinsville soil. Permeability is moderate in the upper part of the profile and rapid in the lower part. Organic matter content is moderate. Surface runoff is slow. The surface

layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few small areas are wooded.

This soil is well suited to corn, soybeans, and small grain. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Reinforcing foundations and footings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of low strength, the shrink-swell potential, and frost action. Strengthening the base material improves the ability of the road to support traffic. Establishing drainage ditches and installing culverts help to prevent the damage caused by frost action. The soil is suitable as a site for septic tank absorption fields.

The land capability classification is I. The woodland ordination symbol is 1a.

McB—Martinsville loam, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is on terraces. Areas are irregular in shape and are 2 to 40 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is about 34 inches thick. It is dark brown, firm sandy clay loam and clay loam in the upper part and dark yellowish brown, friable loam in the lower part. The substratum to a depth of 60 inches is brown sandy loam. In some areas the surface layer and subsoil are less clayey.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Whitaker soils. These soils are in the lower landscape positions. They make up 2 to 8 percent of the unit.

Available water capacity is moderate in the Martinsville soil. Permeability is moderate in the upper part of the profile and rapid in the lower part. Organic matter content is low. Surface runoff is medium. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few are wooded.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Crop rotations that include grasses and legumes, terraces, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to control erosion and maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings. Reinforcing foundations and footings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of low strength, the shrink-swell potential, and frost action. Strengthening the base material improves the ability of the road to support traffic. Establishing drainage ditches and installing culverts help to prevent the damage caused by frost action. The soil is suitable as a site for septic tank absorption fields.

The land capability classification is IIe. The woodland ordination symbol is 1a.

Mh—Milford silty clay loam. This deep, nearly level, very poorly drained soil is in depressions on lake plains. It is frequently ponded by runoff from the higher lying adjacent slopes (fig. 6). Areas are elongated or oval and are 3 to 200 acres in size.

In a typical profile, the surface layer is very dark gray silty clay loam about 7 inches thick. The subsurface layer also is very dark gray silty clay loam. It is about 4 inches thick. The subsoil is dark gray and gray, mottled, firm silty clay loam about 32 inches thick. The substratum to a depth of 60 inches is gray, mottled silty clay loam that has thin strata of fine sand. In a few small areas the soil is underlain by glacial till.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Whitaker soils in the slightly higher landscape positions. Also included are small areas of the organic Houghton soils in the slightly

Figure 6.—Ponding in an area of Milford silty clay loam.

lower positions. Included soils make up 4 to 8 percent of the unit.

Available water capacity is high in the Milford soil. Permeability is moderately slow. Organic matter content is high. Surface runoff is very slow or ponded. The water table is at or above the surface for a significant part of the year. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. Conservation tillage, which leaves all or part of the crop residue on the surface, helps to maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses, such as reed canarygrass, and to shallow-rooted legumes for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa. A drainage system is needed. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

Because the ponding is a severe hazard, this soil is generally unsuitable as a site for dwellings. Because the ponding is a severe hazard and the moderately slow permeability a severe limitation, the soil is generally unsuitable as a site for septic tank absorption fields. It is severely limited as a site for local roads and streets because of frost action, ponding, and low strength. Elevating the road on raised, well compacted fill, establishing adequate side ditches, and installing culverts help to overcome these limitations.

The land capability classification is IIw. No woodland ordination symbol is assigned.

Mk—Montgomery silty clay. This deep, nearly level, very poorly drained soil is in depressions on lake plains. It is frequently ponded by runoff from the higher lying adjacent slopes. Areas are elongated or oval and are 3 to 200 acres in size.

In a typical profile, the surface layer is black silty clay about 12 inches thick. The subsoil is dark gray and grayish brown, mottled, very firm silty clay about 15 inches thick. The substratum to a depth of 60 inches is light brownish gray and dark grayish brown silty clay and silty clay loam. In a few small areas the soil is underlain by glacial till.

Included with this soil in mapping are a few small areas of the mucky Houghton soils in the slightly lower

landscape positions. These soils make up about 5 percent of the unit.

Available water capacity is high in the Montgomery soil. Permeability is slow. Organic matter content is high. Surface runoff is very slow or ponded. The water table is at or above the surface for a significant part of the year. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture or are wooded.

If adequately drained, this soil is fairly well suited to corn, soybeans, and small grain. The wetness is the main limitation. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. Conservation tillage, which leaves all or part of the crop residue on the surface, helps to maintain or improve organic matter content and soil tilth.

If adequately drained, this soil is well suited to grasses, such as reed canarygrass, and to shallow-rooted legumes for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa. A drainage system is needed. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is fairly well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Using special planting stock and overstocking help to overcome seedling mortality. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard. Special harvesting methods and site preparation may be needed to control plant competition.

Because the ponding and the shrink-swell potential are severe limitations, this soil is generally unsuitable as a site for dwellings. Because the ponding and the slow permeability are severe limitations, the soil is generally unsuitable as a site for septic tank absorption fields. It is severely limited as a site for local roads and streets because of the ponding, the shrink-swell potential, and low strength. Elevating the road on raised, well compacted fill, establishing adequate side ditches, and installing culverts help to overcome these limitations.

The land capability classification is IIIw. The woodland ordination symbol is 2w.

MoC2—Morley silty clay loam, 6 to 12 percent slopes, eroded. This deep, moderately sloping, well drained soil is on ridges and side slopes on till plains and moraines. Areas are irregular in shape and are 3 to 15 acres in size.

In a typical profile, the surface layer is dark grayish brown silty clay loam about 9 inches thick. The subsoil is about 20 inches thick. The upper part is dark yellowish brown, very firm clay, and the lower part is yellowish brown, firm clay loam. The substratum to a depth of 60 inches is yellowish brown clay loam. In a few small areas the surface layer is silt loam.

Included with this soil in mapping are a few small areas of the moderately well drained Glynwood soils on the less sloping parts of the landscape. Also included are small areas of severely eroded soils on the steeper slopes. Included soils make up 4 to 8 percent of the unit.

Available water capacity is moderate in the Morley soil. Permeability is slow. Organic matter content is moderate. Surface runoff is medium. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. Some are wooded.

This soil is fairly well suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Crop rotations that include grasses and legumes, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to control erosion and maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses and legumes for hay or pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

Because of the shrink-swell potential and the slope, this soil is moderately limited as a site for dwellings. Reinforcing foundations, footings, and basement walls, backfilling with coarse textured material, and installing foundation drains help to prevent the structural damage caused by shrinking and swelling. Buildings should be designed so that they conform to the natural slope of the land. The soil is severely limited as a site for local roads and streets because of low strength. Strengthening the base material improves the ability of the road to support traffic. The soil is severely limited as a site for septic tank absorption fields because of the slow permeability. The slowly permeable material can be replaced by more permeable material.

The land capability classification is IIIe. The woodland ordination symbol is 2a.

MoD2—Morley silty clay loam, 12 to 18 percent slopes, eroded. This deep, strongly sloping, well drained soil is ridges and side slopes on till plains and moraines. Areas are irregular in shape and are 3 to 15 acres in size.

In a typical profile, the surface layer is dark brown silty clay loam about 6 inches thick. The subsoil is about 20 inches thick. It is yellowish brown. The upper part is firm clay loam, and the lower part is very firm clay. The substratum to a depth of 60 inches is brown clay loam. In a few small areas the surface layer is silt loam.

Included with this soil in mapping are a few small areas of steeper soils. Also included are small areas of severely eroded soils. Included soils make up 4 to 8 percent of the unit.

Available water capacity is moderate in the Morley soil. Permeability is slow. Organic matter content is moderate. Surface runoff is rapid. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Many areas of this soil are wooded. Some are used for cultivated crops, and some are used for hay or pasture.

This soil is poorly suited to corn, soybeans, and small grain. These crops should be grown in a rotation dominated by grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Crop rotations that include grasses and legumes, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to control erosion and maintain or improve organic matter content and soil tilth.

This soil is fairly well suited to grasses and legumes for hay and is well suited to pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture and soil in good condition.

This soil is poorly suited to trees. The main management concerns are the equipment limitation, the erosion hazard, and plant competition. Special techniques, such as yarding logs uphill with a cable, may be needed to minimize the use of rubber-tired vehicles. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling. Establishing roads, skid trails, and landings on gentle grades reduces the erosion hazard.

Because of the slope, this soil is severely limited as a site for dwellings. Buildings should be designed so that they conform to the natural slope of the land. The soil is severely limited as a site for local roads and streets because of the slope and low strength. Roads should be built on the contour. Strengthening the base material improves the ability of the road to support traffic. The soil is severely limited as a site for septic tank absorption fields because of the slope and the slow permeability. The absorption field should be installed on the contour. The slowly permeable material can be replaced by more permeable material.

The land capability classification is IVe. The woodland ordination symbol is 2r.

Na—Nappanee silt loam, 0 to 3 percent slopes. This deep, nearly level, somewhat poorly drained soil is in slightly raised areas on moraines. Areas are irregular in shape and are 3 to 350 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 17 inches thick. The upper part is light brownish gray, mottled, firm silty clay loam, and the lower part is dark yellowish brown, mottled, firm and very firm clay. The substratum to a depth of 60 inches is grayish brown, mottled clay. In some areas the surface layer and subsoil contain more sand. In other areas the slope is more than 3 percent.

Included with this soil in mapping are a few small areas of the moderately well drained St. Clair soils on slope breaks and in the higher landscape positions and small areas of the very poorly drained Pewamo soils in depressions. Included soils make up about 8 percent of the unit.

Available water capacity is moderate in the Nappanee soil. Permeability is slow. Organic matter content is moderate. Surface runoff is slow. The water table is at a depth of 1 to 2 feet for a significant part of the year. The surface layer may crust after rains, so that young seedlings, especially soybeans, have difficulty emerging.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few are wooded.

If adequately drained, this soil is fairly well suited to corn, soybeans, and small grain. The wetness is the major limitation. It can be reduced by subsurface drains. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to control erosion and maintain or improve organic matter content and soil tilth.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. It is less well suited to deep-rooted legumes, such as alfalfa, than to shallow-rooted legumes. The major management concerns are overgrazing and grazing when the soil is wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is fairly well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Using special planting stock and overstocking help to overcome seedling mortality. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard. Special harvesting methods and site preparation may be needed to control plant competition.

Because of the wetness, this soil is severely limited as a site for dwellings. An adequate subsurface drainage system is needed to lower the water table. The soil is severely limited as a site for local roads and streets because of low strength. Replacing or strengthening the base material improves the ability of the road to support traffic. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. A subsurface perimeter drainage system reduces the wetness. The slowly permeable material can be replaced by more permeable material.

The land capability classification is IIIw. The woodland ordination symbol is 3c.

Pm—Pewamo silty clay. This deep, nearly level, very poorly drained soil is in depressions on till plains and moraines. It is frequently ponded by runoff from the higher lying adjacent slopes. Areas are irregular in shape and are 3 to 300 acres in size.

In a typical profile, the surface layer is very dark grayish brown silty clay about 8 inches thick. The subsurface layer also is very dark grayish brown silty clay. It is about 4 inches thick. The subsoil is mottled, firm silty clay about 43 inches thick. It is gray in the upper part and dark brown in the lower part. The substratum to a depth of 60 inches is dark brown, mottled silty clay loam. In few small areas the dark surface soil is less than 10 inches thick. In some areas lighter colored material has been deposited on the original dark surface layer. In other areas the soil is more clayey in the surface soil and subsoil and is underlain by silty clay lacustrine material.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Blount, Haskins, and Nappanee soils on swells. Also included, along drainageways, are small areas of soils that have a slope of more than 2 percent. Included soils make up about 5 percent of the unit.

Available water capacity is high in the Pewamo soil. Permeability is moderately slow. Organic matter content is moderate. Surface runoff is very slow or ponded. The water table is at or above the surface for a significant part of the year. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture or are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. Conservation tillage, which leaves all or part of the crop residue on the surface, helps to maintain or improve organic matter content and soil tilth.

If adequately drained, this soil is well suited to grasses, such as reed canarygrass, and to shallow-rooted legumes for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is fairly well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Using special planting stock and overstocking help to overcome seedling mortality. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard. Special harvesting methods and site preparation may be needed to control plant competition.

Because the ponding is a severe hazard, this soil is generally unsuitable as a site for dwellings. Because the ponding is a severe hazard and the moderately slow permeability a severe limitation, the soil is generally unsuitable as a site for septic tank absorption fields. It is severely limited as a site for local roads and streets because of frost action, ponding, and low strength. Elevating the road on raised, well compacted fill, establishing adequate side ditches, and installing culverts help to overcome these limitations.

The land capability classification is IIw. The woodland ordination symbol is 2w.

Px—Pits. These are open excavations from which sand, gravel, and limestone have been removed for private or commercial use. Some pits are shallow, and others are as much as 30 feet deep. Some contain water. Areas range from 2 to 40 acres in size.

The gravel pits are typically along the leading edge of moraines or in stream valleys. Generally, a thick overburden of clayey material has been removed. Many gravel deposits are only a few feet thick over till or bedrock. The limestone pits also have a thick overburden. They are of limited extent.

Abandoned pits have little value for farming. They are suited to wildlife habitat and recreation uses, especially if they contain water deep enough for fish. The pits that contain water are excellent watering places for deer and other wildlife.

No land capability classification or woodland ordination symbol is assigned.

RdB—Rawson loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on ridges and knolls on till plains and moraines. Areas are irregular in shape and are 2 to 20 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is about 29 inches thick. The upper part is yellowish brown, friable sandy loam; the next part is yellowish brown, firm clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam. The substratum to a depth of 60 inches is brown, very firm silty clay loam.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Haskins soils in the lower landscape positions. Also included are a few areas of severely eroded soils. Included soils make up 4 to 8 percent of the unit.

Available water capacity is moderate in the Rawson soil. Permeability is moderate in the upper part of the profile and slow in the lower part. Organic matter content is moderate. Surface runoff is medium. The water table is at a depth of 2.5 to 4.0 feet for a significant part of the year. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few small areas are wooded.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Crop rotations that include grasses and legumes, terraces, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to control erosion and maintain or improve organic matter content and soil tilth. Subsurface drains are needed to remove excess water from seepy areas in some of the drainageways and swales.

This soil is well suited to grasses and legumes for hay or pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

This soil is suitable as a site for dwellings without basements but is moderately limited as a site for dwellings with basements because of shrinking and swelling and wetness. Reinforcing foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. An adequate subsurface drainage system is needed to lower the water table. The soil is moderately limited as a site for local roads and streets because of frost action. Drainage ditches and culverts help to prevent the damage caused by frost action. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. A subsurface perimeter drainage system reduces the wetness. The slowly permeable material can be replaced by more permeable material.

The land capability classification is IIe. The woodland ordination symbol is 2a.

SaB2—St. Clair clay loam, 3 to 8 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is on till plains and moraines. Areas are irregular in shape and are 2 to 50 acres in size.

In a typical profile, the surface layer is dark grayish brown clay loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part is brown, firm clay, and the lower part is dark yellowish brown, mottled, very firm clay and silty clay. The substratum to a depth of 60 inches is dark yellowish brown silty clay. In a few small areas the upper part of the soil has more sand and less clay.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Nappanee soils in the lower landscape positions and the well drained Morley soils on the higher slope breaks. Also included are small areas of severely eroded soils that have a clay surface layer. Included soils make up 8 to 12 percent of the unit.

Available water capacity is moderate in the St. Clair soil. Permeability is slow. Organic matter content is moderate. Surface runoff is medium. The water table is at a depth of 2 to 3 feet for a significant part of the year. If tilled when wet, this soil becomes cloddy and cannot be easily worked.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few are wooded.

This soil is fairly well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Crop rotations that include grasses and legumes, terraces, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to control erosion and maintain or improve organic matter content and soil tilth. Subsurface drains are needed to remove excess water from seepy areas in some of the drainageways and swales.

This soil is well suited to grasses and legumes for hay or pasture. A cover of grasses and legumes is effective

in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is poorly suited to trees. The main management concerns are seedling mortality and the windthrow hazard. Using special planting stock and overstocking help to overcome seedling mortality. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard.

Because of shrinking and swelling and wetness, this soil is severely limited as a site for dwellings. Reinforcing foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. An adequate subsurface drainage system is needed to lower the water table. The soil is severely limited as a site for local roads and streets because of shrinking and swelling and low strength. Establishing drainage ditches and replacing or strengthening the base material improve the ability of the road to support traffic. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. A subsurface perimeter drainage system reduces the wetness. The slowly permeable material can be replaced by more permeable material.

The land capability classification is IIIe. The woodland ordination symbol is 3c.

Sc—Saranac clay, frequently flooded. This deep, nearly level, very poorly drained soil is on bottom lands. It is frequently flooded for brief periods by overflow from streams. Most areas are elongated and are 3 to 200 acres in size.

In a typical profile, the surface layer is very dark grayish brown clay about 9 inches thick. The subsurface layer also is very dark grayish brown clay. It is about 3 inches thick. The subsoil is very dark gray and dark gray, mottled, firm clay about 26 inches thick. The upper part of the substratum is gray, mottled clay loam. The lower part to a depth of 60 inches is dark grayish brown, mottled loam that has thin strata of clay loam and sandy loam. In some areas the surface layer is not dark. In a few small areas the soil contains more sand and less clay throughout.

Included with this soil in mapping are a few small areas of the well drained Armiesburg and somewhat poorly drained Tice soils in the slightly higher landscape positions. These soils make up about 5 percent of the unit.

Available water capacity is high in the Saranac soil. Permeability is moderately slow. Organic matter content is high. Surface runoff is very slow. The water table is at or near the surface for a significant part of the year. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Nearly all areas of this soil are used for cultivated crops. A few areas are used for hay or pasture. A few are wooded.

This soil is fairly well suited to corn and soybeans. The flooding and the wetness are the main management concerns. Some flood damage can be expected during the cropping season. Subsurface drains reduce the wetness. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses, such as reed canarygrass, and to some legumes for hay or pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the flooding. The major management concerns are overgrazing and grazing when the soil is wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is fairly well suited to trees. The main management concerns are the equipment limitiation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Using special planting stock and overstocking help to overcome seedling mortality. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard. Special harvesting methods and site preparation may be needed to control plant competition.

Because the flooding is a severe hazard and the wetness and moderately slow permeability are severe limitations, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of wetness, low strength, and flooding. Elevating the road on raised, well compacted fill, establishing adequate side ditches, and installing culverts help to overcome these limitations.

The land capability classification is IIIw. The woodland ordination symbol is 2w.

Sh—Shoals clay loam, frequently flooded. This deep, nearly level, somewhat poorly drained soil is on bottom lands. It is frequently flooded for brief periods by overflow from streams. Areas are generally elongated and are 2 to 30 acres in size.

In a typical profile, the surface layer is dark grayish brown clay loam about 9 inches thick. The substratum extends to a depth of about 60 inches. It is, in sequence downward, dark grayish brown clay loam; grayish brown, mottled loam; brown, mottled clay loam and sandy clay loam; and dark grayish brown, mottled sandy clay loam and fine sandy loam stratified with thin layers of loam,

silty clay loam, and fine sand. In some areas the surface layer is dark.

Included with this soil in mapping are a few small areas of the very poorly drained Sloan soils. These soils are in low areas. Also included are a few small areas of the well drained Chagrin soils in the slightly higher landscape positions. Included soils make up 8 to 12 percent of the unit.

Available water capacity is high in the Shoals soil. Permeability is moderate. Organic matter content also is moderate. Surface runoff is slow. The water table is at a depth of 0.5 foot to 1.5 feet for a significant part of the year. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few small areas are wooded.

This soil is well suited to corn and soybeans. The flooding and the wetness are the main management concerns. Some flood damage can be expected during the cropping season. Subsurface drains reduce the wetness. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses, such as reed canarygrass, and to most legumes for hay or pasture, but it is poorly suited to deep-rooted legumes, such as alfalfa, because of the flooding. The major management concerns are overgrazing and grazing when the soil is wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is fairly well suited to trees. The main management concerns are the equipment limitation, seedling mortality, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Using special planting stock and overstocking help to overcome seedling mortality. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

Because the flooding is a severe hazard and the wetness a severe limitation, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of wetness, flooding, and frost action. Elevating the road on raised, well compacted fill, establishing adequate side ditches, and installing culverts help to overcome these limitations.

The land capability classification is IIw. The woodland ordination symbol is 2w.

Sl—Sloan loam, frequently flooded. This deep, nearly level, very poorly drained soil is on bottom lands. It is frequently flooded for brief periods by overflow from streams. Most areas are elongated and are 3 to 40 acres in size.

In a typical profile, the surface layer is very dark grayish brown loam about 8 inches thick. The subsurface layer also is very dark grayish brown loam. It is about 5 inches thick. The subsoil is about 32 inches thick. The upper part is dark gray, mottled, friable and firm clay loam, and the lower part is gray, mottled, firm clay loam and friable sandy clay loam. The substratum to a depth of 60 inches is grayish brown, mottled, stratified sandy loam and loam. In a few small areas the subsoil is clayey.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Shoals soils in the slightly higher landscape positions. These soils make up 4 to 8 percent of the unit.

Available water capacity is high in the Sloan soil. Permeability is moderate. Organic matter content is high. Surface runoff is very slow. The water table is at or near the surface for a significant part of the year. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Nearly all areas of this soil are used for cultivated crops. A few areas are used for hay or pasture. A few small areas are wooded.

If adequately drained and protected from flooding, this soil is fairly well suited to corn and soybeans. The flooding and the wetness are the main problems. Some flood damage can be expected during the cropping season. Subsurface drains reduce the wetness. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses, such as reed canarygrass, and to shallow-rooted legumes for hay or pasture, but it is poorly suited to deep-rooted legumes, such as alfalfa, because of the flooding. The major management concerns are overgrazing and grazing when the soil is wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is fairly well suited to trees. The main management concerns are the equipment limitation, seedling mortality, the windthrow hazard, and plant competition. Equipment should be operated only when the soil is relatively dry or frozen. Using special planting stock and overstocking help to overcome seedling mortality. Removing fewer trees than is typical when a stand is thinned or removing none helps to overcome the windthrow hazard. Special harvesting methods and site preparation may be needed to control plant competition.

Because the flooding is a severe hazard and the wetness a severe limitation, this soil is generally unsuitable as a site for dwellings and septic tank

absorption fields (fig. 7). It is severely limited as a site for local roads and streets because of wetness, low strength, and flooding. Elevating the road on raised, well compacted fill, establishing adequate side ditches, and installing culverts help to overcome these limitations.

The land capability classification is IIIw. The woodland ordination symbol is 2w.

Tc—Tice silty clay loam, frequently flooded. This deep, nearly level, somewhat poorly drained soil is on bottom lands. It is frequently flooded for brief periods by overflow from streams. Areas are long and narrow and are 3 to 30 acres in size.

In a typical profile, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. The subsurface layer also is very dark grayish brown silty clay loam. It is about 5 inches thick. The subsoil is about 39 inches thick. It is mottled and firm. The upper part is dark brown silty clay loam, the next part is brown silty clay loam, and the lower part is dark yellowish brown clay loam. The substratum to a depth of 60 inches is dark brown, mottled sandy loam that has thin strata of sandy clay loam, clay loam, and loam. In some areas the surface layer is browner.

Included with this soil in mapping are small areas of the very poorly drained Saranac soils in the lower landscape positions and the well drained Armiesburg soils in the higher positions. Included soils make up about 8 percent of the unit.

Available water capacity is high in the Tice soil. Permeability is moderate. Organic matter content also is moderate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet for a significant part of the year. If tilled when wet, the surface layer becomes cloddy and cannot be easily worked.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few small areas are wooded.

This soil is fairly well suited to corn and soybeans. The flooding and the wetness are the main management

Figure 7.—Flooding in an area of Sloan loam, frequently flooded, used as a site for dwellings.

concerns. Some flood damage can be expected during the cropping season. Subsurface drains reduce the wetness. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to maintain or improve organic matter content and soil tilth.

This soil is well suited to grasses, such as reed canarygrass, and to legumes for hay or pasture, but it is poorly suited to deep-rooted legumes, such as alfalfa, because of the flooding. The major management concerns are overgrazing and grazing when the soil is wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

Because the flooding is a severe hazard and the wetness a severe limitation, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of low strength, flooding, and frost action. Elevating the road on raised, well compacted fill, establishing adequate side ditches, and installing culverts help to overcome these limitations.

The land capability classification is IIIw. The woodland ordination symbol is 2a.

Ud—Udorthents, loamy. These deep, somewhat poorly drained soils are in areas that have been disturbed to the extent that the original soils cannot be recognized. These soils generally are nearly level. Most of the areas were disturbed by tile and brick manufacturers in the vicinity of Decatur. Areas are irregular in shape and are 3 to 300 acres in size.

Typically, most of the subsoil has been removed and the surface has been smoothed out by machinery. The soil material is dominantly clay loam and silty clay loam.

Included with these soils in mapping are a few areas where the original soils remain. Roads and other public works and buildings cover much of some areas. Also included are some ponded areas, which are not filled in because of a lack of sufficient soil material. Some of these ponded areas have been deepened to as much as 10 to 12 feet.

Available water capacity is high in the Udorthents. Permeability is slow or very slow. Much of the original topsoil has been lost or destroyed, so the present surface layer is mostly the parent material of the original soils. Consequently, the content of organic matter is low. Surface runoff generally is very slow, and some areas are ponded.

Some areas of these soils are used as building sites. Some are used for grasses, and some are idle. Very few areas are used for row crops.

No land capability classification or woodland ordination symbol is assigned.

Wh—Whitaker silt loam. This deep, nearly level, somewhat poorly drained soil is on terraces. Most areas are irregular in shape and are 2 to 200 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsurface layer is grayish brown loam about 5 inches thick. The subsoil is about 37 inches thick. The upper part is pale brown, mottled, friable loam; the next part is gray, mottled, firm clay loam; and the lower part is dark gray, mottled, firm sandy clay loam. The substratum to a depth of 60 inches is dark gray, mottled clay loam that has thin strata of silty clay loam and fine sand. In some areas the surface layer is dark. In other areas the surface soil and subsoil are more clayey.

Included with this soil in mapping are a few small areas of the well drained Martinsville soils in the higher landscape positions and the very poorly drained Milford soils in depressions. Included soils make up 4 to 8 percent of the unit.

Available water capacity is high in the Whitaker soil. Permeability is moderate. Organic matter content also is moderate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet for a significant part of the year. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Nearly all areas of this soil are used for cultivated crops. Only a few areas are used for hay or pasture or for woodland.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. It can be reduced by subsurface drains. Conservation tillage, which leaves all or part of the crop residue on the surface, and cover crops help to maintain or improve organic matter content and soil tilth.

If adequately drained, this soil is well suited to grasses, such as reed canarygrass, and to some legumes for hay or pasture. It is not so well suited to deep-rooted legumes, such as alfalfa, because of the wetness. The major management concerns are overgrazing and grazing when the soil is wet. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. The main management concern is plant competition. Special harvesting methods and site preparation may be needed to control plant competition. Unwanted trees and shrubs can be controlled or removed by spraying, cutting, or girdling.

Because of the wetness, this soil is severely limited as a site for dwellings and septic tank absorption fields. An adequate subsurface drainage system is needed to lower the water table. The soil is severely limited as a site for local roads and streets because of frost action. Drainage ditches help to prevent the damaged caused by frost action.

The land capability classification is IIw. The woodland ordination symbol is 3a.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 212,745 acres in Adams County, or nearly 98 percent of the total acreage, meets the soil requirements for prime farmland. Nearly all of this prime farmland is used for corn and soybeans.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 5. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Soils that have limitations, such as a seasonal high water table, frequent flooding during the growing season, or inadequate rainfall, qualify for prime farmland only in areas where these limitations have been overcome by such measures as drainage, flood control, or irrigation. The need for these measures is indicated after the map unit name on the following list. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

The map units that meet the soil requirements for prime farmlands are—

Am Armiesburg silty clay loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
BcA Blount silt loam, 0 to 1 percent slopes (where drained)
BcB Blount silt loam, 1 to 4 percent slopes (where drained)
Ch Chagrin loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
GoB Glynwood silt loam, 3 to 8 percent slopes
HaA Haskins loam, 1 to 3 percent slopes (where drained)
McA Martinsville loam, 0 to 2 percent slopes
McB Martinsville loam, 2 to 6 percent slopes
Mh Milford silty clay loam (where drained)
Mk Montgomery silty clay loam (where drained)
Na Nappanee silt loam, 0 to 3 percent slopes (where drained)
Pm Pewamo silty clay (where drained)
RdB Rawson loam, 2 to 6 percent slopes
SaB2 St. Clair clay loam, 3 to 8 percent slopes, eroded
Sc Saranac clay, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Sh Shoals clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Sl Sloan loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Tc Tice silty clay loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
Wh Whitaker silt loam (where drained)

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Tony N. Tate, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 175,000 acres in Adams County, or about 80 percent of the total acreage, is used for crops, and about 12,100 acres is used for pasture (*4*). The main crops are corn, soybeans, small grain, and forage grasses and legumes. These crops are grown throughout the county. A small acreage is used for specialty crops. Tomatoes are grown in the southwestern and west-central parts of the county. Potatoes are grown on the Houghton soils in the southeastern part. Other crops included sugar beets, popcorn, sweet corn, and nursery stock.

Many grasses and legumes suitable for hay and pasture are grown in the county. Grasses include orchardgrass, reed canarygrass, timothy, bromegrass, tall fescue, and Kentucky bluegrass. Legumes include alfalfa, birdsfoot trefoil, ladino clover, red clover, alsike clover, and sweet clover.

The major concerns in managing the soils in Adams County are wetness, erosion and soil blowing, and tilth. The major conservation practices are tile drainage, grassed waterways, rock chutes, ponds, conservation tillage, and waste management for confined feeding systems. Windbreaks and tree planting are also important conservation practices. Fertilizer and lime are used widely and are applied according to soil tests.

Wetness is the major problem in Adams County. A drainage system is needed in Blount, Montgomery, Pewamo, and Whitaker soils. Excess water can be removed by subsurface drains, surface drains, waterways, terraces, and open ditches (fig. 8). There are hundreds of miles of open ditches and subsurface drains in the county. Many of the open ditches are adequate and well maintained, but others should be redesigned and reconstructed.

Drainage systems vary greatly. The design depends on the nature of the soils, the topography of the land, the location and type of drainage outlets, and the kind of crop to be grown. Farm drainage systems are made up of surface drainageways, both natural and manmade,

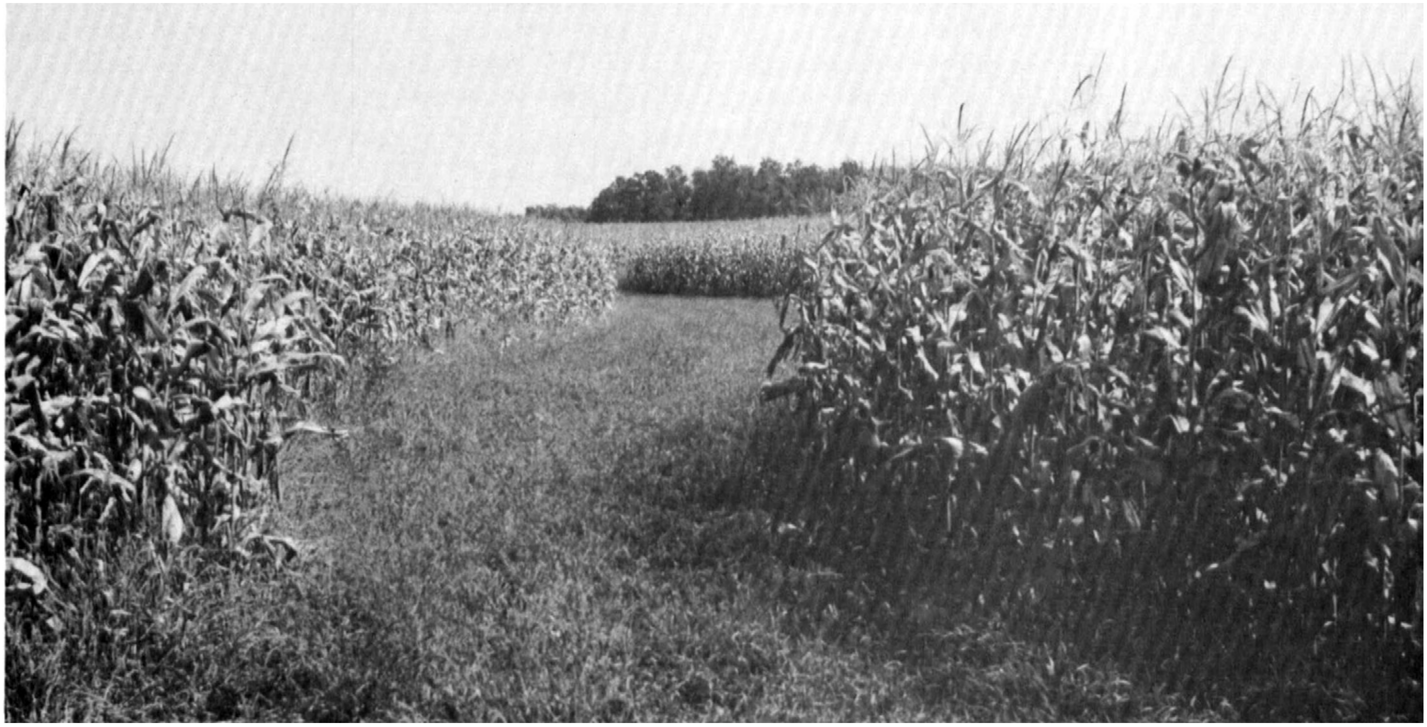

Figure 8.—A grassed waterway, which carries runoff through fields without the formation of gullies.

subsurface drains, and open ditches. Surface drains and open ditches carry off most of the excess water that cannot be absorbed by the soil after heavy rains. Subsurface drains are used primarily to remove excess water from within the soil in order to keep the soil from becoming too wet for cultivation and to prevent crop damage.

Water erosion is a hazard on Glynwood, Martinsville, Morley, and St. Clair soils. Soils having a slope of more than 2 percent are susceptible to erosion. Wetness also is a limitation in many of these soils. This combination of problems makes management of these soils extremely difficult.

Soil erosion is damaging for several reasons. Productivity is reduced because of losses of nutrients. The friable surface layer becomes firm, and the quality of the seedbed deteriorates. The eroded sediment is deposited in lower areas and in open ditches, streams, and rivers. Erosion also causes problems in drainageways, along the major rivers, and along open ditches. Rock chutes are widely used to protect ditchbanks and drainageways from erosion.

Erosion can be controlled by proper conservation practices. Examples of these practices are crop residue management; crop rotations that include grasses and legumes; conservation tillage, which leaves all or part of the crop residue on the surface; grassed waterways; and parallel tile outlet terraces. These practices can be used alone or in combinations, depending on the kind of soil and the topography of the land.

Soil blowing occurs after some soils, such as Houghton soils, are plowed in fall. The effects of soil blowing are readily apparent when snow is on the ground. Soil blowing is minor in this county compared to the losses caused by water erosion.

Tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Some of the soils used for crops in Adams County have a silt loam surface layer that contains a moderate amount of organic matter. Blount and Whitaker soils are examples. The structure of these soils is ~~weakly~~ moderate granular. Heavy rainfall causes the formation of a surface crust that, when dry, is very hard and nearly impervious to water. Once this hard crust has formed, the runoff rate and the erosion hazard increase and water is not available to plants. Crop residue management can improve soil structure and help to prevent crusting.

The dark colored soils, such as Milford, Saranac, and Pewamo soils, are clayey, and cultivating them is difficult because they remain wet throughout the spring. If

cultivated when wet, these soils tend to form clods and develop a thick compacted layer under the plow layer. Consequently, preparing a good seedbed is difficult. Fall plowing may be beneficial on these soils. Chiseling and ridge planting in the fall have also been helpful on these wet soils.

On the light colored soils, such as Blount, Glynwood, and St. Clair soils, fall plowing is not a good practice. Many areas of these soils are sloping and thus are subject to severe erosion after being plowed in the fall.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in table 6.

Woodland Management and Productivity

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each suitable soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. It is based on the site index of the species listed first in the *common trees* column. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *r* indicates steep slopes; *x*, stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted rooting depth; *c*, clay in the upper part of the soil; *s*, sandy texture; and *f*, high content of coarse fragments in the soil profile. The letter *a* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: r, x, w, t, d, c, s, and f.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a

site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, wheat, oats, sorghum, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are timothy, bromegrass, bluegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, ragweed, pokeweed, sheep sorrel, dock, crabgrass, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, maple, beech, wild cherry, sweetgum, willow, black walnut, apple, hawthorn, dogwood, hickory, hazelnut, blackberry, and elderberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, crabapple, Washington hawthorn, and shrub dogwood.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, spikerush, wild millet, waterplantain, arrowhead, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, dove, meadowlark, killdeer, field sparrow, cottontail, red fox, and woodchuck.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rails, kingfishers, muskrat, mink, and beaver.

Edge habitat is the areas where major land uses or cover types adjoin. A good example is the border between dense woodland and a field of no-till corn. Although not rated in the table, edge habitat is of primary importance to animals from the smallest songbirds to white-tailed deer. Most of the animals that inhabit openland or woodland habitat also frequent edge habitat, and desirable edge areas are consistently used by 10 times as many wildlife as are the centers of large areas of woodland or cropland.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings

in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to

overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope of the soil affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are

easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

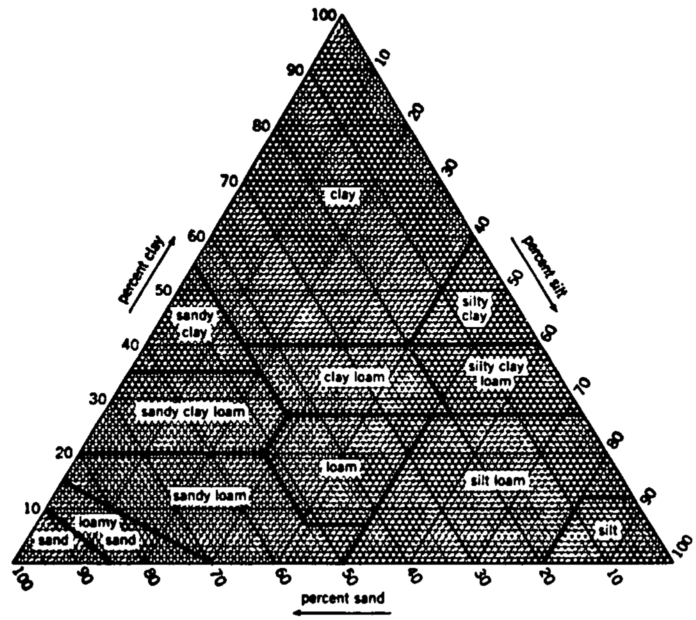

Figure 9.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 9). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of

grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to

buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*6*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*5*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*6*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Armiesburg Series

The Armiesburg series consists of deep, well drained, moderately permeable soils on bottom lands. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Armiesburg soils commonly are adjacent to Saranac and Tice soils. The adjacent soils are grayer throughout the solum than the Armiesburg soils and are in lower landscape positions. Also, Saranac soils have more clay in the underlying layers.

Typical pedon of Armiesburg silty clay loam, frequently flooded, in a cultivated field; 700 feet south and 250 feet west of the center of sec. 12, T. 28 N., R. 13 E.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.
A—11 to 20 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.
Bw1—20 to 32 inches; dark brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; friable; thin continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine roots; neutral; clear smooth boundary.
Bw2—32 to 44 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.
C—44 to 60 inches; brown (10YR 4/3) silty clay loam; massive; firm; neutral.

The solum is 34 to 50 inches thick. The Ap and A horizons have chroma of 2 or 3. They are dominantly silty clay loam, but the range includes silt loam. The Bw horizon has value of 4 or 5.

Blount Series

The Blount series consists of deep, somewhat poorly drained, slowly permeable soils on till plains. These soils formed in glacial till. Slopes range from 0 to 4 percent.

Blount soils are similar to Nappanee soils and commonly are adjacent to Glynwood and Pewamo soils. Nappanee soils have more clay in the underlying material than the Nappanee soils. Glynwood soils are moderately well drained and are in the higher landscape positions. Pewamo soils have a surface layer that is darker than that of the Blount soils and are grayer throughout the solum. They are in depressions.

Typical pedon of Blount silt loam, 0 to 1 percent slopes, in a cultivated field; 1,250 feet south and 1,100 feet east of the northwest corner of sec. 10, T. 26 N., R. 14 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.
Bt1—9 to 12 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; common fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films and thin continuous brown (10YR 5/3) silt coatings on faces of peds; very strongly acid; clear smooth boundary.
Bt2—12 to 17 inches; dark grayish brown (10YR 4/2) silty clay; many medium distinct brown (10YR 5/3 and 7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few pebbles; very strongly acid; clear smooth boundary.
Bt3—17 to 23 inches; dark brown (10YR 4/3) silty clay; many medium distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; very firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thick discontinuous very dark grayish brown (10YR 3/2) clay flows between peds; black (10YR 2/1) iron and manganese oxide accumulations; few pebbles; strongly acid; clear wavy boundary.
Btg1—23 to 29 inches; dark grayish brown (10YR 4/2) clay; few fine distinct dark yellowish brown (10YR 4/6) and gray (10YR 5/1) mottles; weak coarse prismatic structure parting to strong medium angular and subangular blocky; very firm; medium continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thick discontinuous very dark grayish brown (10YR 3/2) clay flows between peds; few pebbles; neutral; clear wavy boundary.
Btg2—29 to 39 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate coarse subangular blocky structure; very firm; thin discontinuous dark grayish brown (10YR 4/2) clay films and thin discontinuous pale brown (10YR 6/3) calcium carbonate coatings on faces of peds; few pebbles; strong effervescence; mildly alkaline; clear wavy boundary.
Cg—39 to 60 inches; grayish brown (10YR 5/2) clay loam; many medium distinct dark yellowish brown (10YR 4/6) mottles; massive; very firm; few pebbles; strong effervescence; moderately alkaline.

The solum is 22 to 43 inches thick. The Ap horizon has chroma of 1 to 3. It is dominantly silt loam, but the range includes loam. The Bt horizon has chroma of 2 to 4. It is very strongly acid to slightly acid in the upper part and slightly acid to mildly alkaline in the lower part. The C horizon is dominantly clay loam, but the range includes silty clay loam.

Chagrin Series

The Chagrin series consists of deep, well drained, moderately permeable soils on bottom lands. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Chagrin soils commonly are adjacent to Shoals soils. The adjacent soils are grayer throughout the solum than the Chagrin soils. Also, they are in lower landscape positions.

Typical pedon of Chagrin loam, frequently flooded, in a cultivated field; 325 feet south and 2,000 feet east of the center of sec. 12, T. 27 N., R. 14 E.

Ap—0 to 10 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

Bw1—10 to 18 inches; dark brown (10YR 4/3) loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; few medium vertical tubular pores; thin continuous dark brown (10YR 3/3) organic coatings on faces of peds and in pores; slightly acid; clear smooth boundary.

Bw2—18 to 28 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few medium vertical tubular pores; thin continuous dark brown (10YR 3/3) organic coatings on faces of peds and in pores; medium acid; clear smooth boundary.

Bw3—28 to 40 inches; dark yellowish brown (10YR 4/4) sandy clay loam; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; few medium vertical tubular pores; thin continuous dark brown (10YR 4/3) organic coatings on faces of peds and in pores; medium acid; clear smooth boundary.

Bw4—40 to 45 inches; dark yellowish brown (10YR 4/4) sandy loam; weak coarse prismatic structure parting to weak fine subangular blocky; firm; thin continuous dark brown (10YR 3/3) organic coatings on faces of peds; medium acid; clear smooth boundary.

C—45 to 60 inches; dark grayish brown (10YR 4/2) loamy fine sand; massive; loose; slightly acid.

The solum is 24 to 45 inches thick. The Ap horizon is loam or fine sandy loam. The Bw horizon has value of 4 or 5. It is dominantly loam or sandy clay loam, but the range includes clay loam. The C horizon has value of 4 or 5 and chroma of 2 to 4. It is stratified with sand or sandy loam. It is medium acid to neutral.

Glynwood Series

The Glynwood series consists of deep, moderately well drained, slowly permeable soils on till plains. These soils formed in glacial till. Slopes range from 3 to 8 percent.

Glynwood soils are similar to St. Clair soils and commonly are adjacent to Blount and Morley soils. St. Clair soils have more clay in the lower part of the B horizon and in the C horizon than the Glynwood soils. Blount soils are grayer in the solum than the Glynwood soils. Also, they are in lower landscape positions. Morley soils are well drained and are in the more sloping areas.

Typical pedon of Glynwood silt loam, 3 to 8 percent slopes, in a cultivated field; 1,050 feet north and 440 feet east of the center of sec. 11, T. 27 N., R. 14 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; friable; common fine and very fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 12 inches; dark yellowish brown (10YR 4/4) clay; moderate coarse prismatic structure parting to moderate medium blocky; firm; common very fine roots; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—12 to 18 inches; dark yellowish brown (10YR 4/4) clay; few medium distinct grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate medium blocky; firm; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

Bt3—18 to 34 inches; dark yellowish brown (10YR 4/6) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; very firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; strong effervescence; moderately alkaline; clear wavy boundary.

C—34 to 60 inches; dark brown (10YR 4/3) silty clay loam; massive; very firm; strong effervescence; moderately alkaline.

The solum is 22 to 40 inches thick. The Ap horizon has chroma of 2 or 3. It is dominantly silt loam, but the range includes clay loam and silty clay loam. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is dominantly clay, clay loam, or silty clay, but in some pedons it has thin layers of silty clay loam. It is medium acid to very strongly acid in the upper part and slightly acid to moderately alkaline in the lower part. The C horizon is silty clay loam or clay loam.

Haskins Series

The Haskins series consists of deep, somewhat poorly drained soils on till plains and moraines. These soils formed in loamy material overlying glacial till. Permeability is moderate in the upper part of the solum and slow in the lower part and in the substratum. Slopes range from 1 to 3 percent.

These soils have less clay in the lower part of the solum than is defined as the range for the Haskin series and are more acid in the upper part of the solum. These differences, however, do not alter usefulness or behavior of the soils.

Haskins soils are similar to Whitaker soils and commonly are adjacent to Pewamo and Rawson soils. Whitaker soils have stratified underlying layers. Pewamo soils are dominantly gray throughout. They are in the

lowest landscape positions. Rawson soils are moderately well drained and are in the higher landscape positions.

Typical pedon of Haskins loam, 1 to 3 percent slopes, in a cultivated field; 50 feet south and 1,905 feet east of the center of sec. 28, T. 25 N., R. 14 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; weak fine and very fine granular structure; friable; few very fine roots; slightly acid; abrupt smooth boundary.

Bt—9 to 12 inches; yellowish brown (10YR 5/4) loam; many coarse distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; very strongly acid; clear smooth boundary.

Btg—12 to 21 inches; dark grayish brown (10YR 4/2) clay loam; many coarse distinct yellowish brown (10YR 5/8) mottles; moderate medium angular and subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; very strongly acid; gradual wavy boundary.

B't—21 to 27 inches; yellowish brown (10YR 5/6) clay loam; common medium prominent gray (5Y 6/1) mottles; moderate medium and coarse subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

2Cg1—27 to 30 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; strong effervescence; moderately alkaline; clear smooth boundary.

2Cg2—30 to 60 inches; brown (10YR 4/3) clay loam; many coarse distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; very firm; strong effervescence; moderately alkaline.

The solum is 25 to 42 inches thick. The Ap horizon has chroma of 1 or 2. It is loam, fine sandy loam, or sandy loam. The Bt horizon is dominantly clay loam, but it has thin layers of loam, sandy loam, or sandy clay loam. It is neutral to very strongly acid. Some pedons have a 2B horizon. This horizon has colors similar to those of the Bt horizon. It is clay loam, silty clay loam, or silty clay. It is neutral or mildly alkaline. The 2C horizon is clay loam or silty clay loam.

Houghton Series

The Houghton series consists of deep, very poorly drained soils in depressional areas of glacial lakes. These soils formed in decomposed marsh vegetation. Permeability is moderately slow to moderately rapid. Slopes range from 0 to 2 percent.

Houghton soils commonly are adjacent to the mineral Milford and Montgomery soils. The adjacent soils are slightly higher on the landscape than the Houghton soils.

Typical pedon of Houghton muck, drained, in a cultivated field; 825 feet south and 100 feet west of the northeast corner of sec. 36, T. 26 N., R. 14 E.

Op—0 to 9 inches; sapric material, black (N 2/0) broken face and rubbed, black (5YR 2/1) dry; about 2 percent fiber, less than 1 percent rubbed; herbaceous fibers; weak fine granular structure; neutral; abrupt smooth boundary.

Oal—9 to 30 inches; sapric material, black (5YR 2/1) broken face and rubbed; about 5 percent fiber, less than 1 percent rubbed; herbaceous fibers; moderate thick platy structure; friable; neutral; abrupt smooth boundary.

Oa2—30 to 60 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 25 percent fiber, 5 percent rubbed; herbaceous fibers; massive; friable; slightly acid.

The organic material is more than 50 inches thick. The surface layer is black (10YR 2/1 or N 2/0). The subsurface and bottom tiers have hue of 10YR to 5YR and value of 2 or 3.

Martinsville Series

The Martinsville series consists of deep, well drained soils on terraces. These soils formed in stratified, loamy deposits. Permeability is moderate in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 6 percent.

These soils have a higher content of coarse fragments in the lower part of the solum than is defined as the range for the Martinsville series. This difference, however, has little effect on the usefulness or behavior of the soils.

Martinsville soils are similar to Rawson soils and commonly are adjacent to Whitaker soils. Rawson soils have more clay in the lower part of the solum and in the underlying material than the Martinsville soils. Whitaker soils are grayer throughout the solum than the Martinsville soils. Also, they are in lower landscape positions.

Typical pedon of Martinsville loam, 0 to 2 percent slopes, in a cultivated field; 2,000 feet south and 240 feet west of the northeast corner of sec. 11, T. 25 N., R. 13 E.

Ap—0 to 10 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; few fine roots; about 5 percent gravel; medium acid; abrupt smooth boundary.

Bt1—10 to 16 inches; dark reddish brown (5YR 3/4) loam; moderate medium subangular blocky

structure; firm; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 8 percent gravel; medium acid; clear smooth boundary.

Bt2—16 to 26 inches; dark reddish brown (5YR 3/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark reddish brown (5YR 3/4) clay films on faces of peds; about 8 percent gravel; very strongly acid; clear smooth boundary.

Bt3—26 to 32 inches; dark reddish brown (5YR 3/4) sandy clay loam; moderate fine and medium subangular blocky structure; friable; few fine roots; thin discontinuous dark reddish brown (5YR 3/4) clay films on faces of peds; about 3 percent gravel; very strongly acid; clear wavy boundary.

Bt4—32 to 41 inches; dark reddish brown (5YR 3/4) sandy clay loam; weak fine subangular blocky structure; friable; few fine roots; thin discontinuous dark reddish brown (5YR 3/4) clay films on faces of peds; about 2 percent gravel; very strongly acid; clear wavy boundary.

2Bt5—41 to 44 inches; dark brown (7.5YR 4/4) sandy loam; single grain; loose; few fine roots; clay bridging between sand grains; about 2 percent gravel; medium acid; clear smooth boundary.

2Bt6—44 to 51 inches; dark reddish brown (5YR 3/3) gravelly sandy clay loam; moderate fine and medium subangular blocky structure; firm; thin continuous dark reddish brown (5YR 3/3) clay films on faces of peds; about 17 percent gravel; neutral; clear wavy boundary.

2BC—51 to 65 inches; dark yellowish brown (10YR 3/4) loam; weak fine and medium subangular blocky structure; friable; clay bridging between sand grains; about 8 percent gravel; medium acid; abrupt irregular boundary.

2C—65 to 80 inches; yellowish brown (10YR 5/4) gravelly sandy loam; single grain; loose; about 27 percent gravel; strong effervescence; mildly alkaline.

The solum is 36 to 65 inches thick. The Ap horizon has chroma of 2 or 3. It is dominantly loam, but the range includes sandy loam and fine sandy loam. The Bt horizon has hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 3 to 6. It is clay loam, sandy clay loam, loam, or sandy loam or the gravelly analogs of these textures. It is very strongly acid to neutral. The C horizon is stratified sand, loamy sand, or coarse sandy loam or the gravelly analogs of these textures.

Milford Series

The Milford series consists of deep, very poorly drained, moderately slowly permeable soils in depressional areas on lake plains. These soils formed in lacustrine deposits. Slopes range from 0 to 2 percent.

Milford soils are similar to Montgomery soils and commonly are adjacent to Houghton and Whitaker soils. Montgomery soils have more clay in the solum than the Milford soils. Houghton soils are organic. They are in the slightly lower landscape positions. Whitaker soils are browner than the Milford soils. Also, they are in slightly higher landscape positions.

Typical pedon of Milford silty clay loam, in a cultivated field; 700 feet south and 1,550 feet east of the northwest corner of sec. 34, T. 25 N., R. 13 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular and blocky structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A—7 to 11 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium angular blocky structure; firm; common fine roots; slightly acid; abrupt smooth boundary.

Bg1—11 to 19 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct light olive brown (2.5Y 5/6) mottles; moderate fine and medium angular blocky structure; firm; few fine roots; thin continuous dark gray (10YR 4/1) organic coatings on faces of peds; neutral; clear smooth boundary.

Bg2—19 to 25 inches; gray (5Y 5/1) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; few fine roots; thin discontinuous dark gray (10YR 4/1) organic coatings on faces of peds; neutral; clear smooth boundary.

Bg3—25 to 35 inches; gray (5Y 5/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; mildly alkaline; clear smooth boundary.

Bg4—35 to 43 inches; gray (10YR 5/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; slight effervescence; moderately alkaline; clear smooth boundary.

Cg—43 to 60 inches; gray (10YR 5/1) silty clay loam that has thin strata of fine sand; many coarse prominent yellowish brown (10YR 5/8) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 36 to 56 inches thick. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam, clay loam, or silty clay. The Cg horizon is dominantly clay loam or silty clay loam. In many pedons, however, it has thin strata of sandy loam, fine sand, or silty clay.

Montgomery Series

The Montgomery series consists of deep, very poorly drained, slowly permeable soils in depressional areas on lake plains. These soils formed in lacustrine sediments. Slopes range from 0 to 2 percent.

Montgomery soils are similar to Milford soils and commonly are adjacent to Houghton soils. Milford soils have less clay in the solum than the Montgomery soils. Houghton soils are organic. They are in the slightly lower landscape positions.

Typical pedon of Montgomery silty clay, in a cultivated field; 1,125 feet east and 875 feet south of the center of sec. 27, T. 26 N., R. 15 E.

Ap—0 to 12 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; moderate fine angular blocky structure; firm; neutral; abrupt smooth boundary.

Bg1—12 to 19 inches; dark gray (10YR 4/1) silty clay; many fine distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; very firm; thin continuous dark gray (10YR 4/1) organic coatings on faces of peds; few medium strong brown (7.5YR 4/6) iron and manganese stains around old root channels and pores; neutral; gradual smooth boundary.

Bg2—19 to 27 inches; grayish brown (2.5Y 5/2) silty clay; many coarse distinct dark gray (10YR 4/1) and common medium faint light olive brown (2.5Y 5/4) mottles; weak coarse prismatic structure parting to moderate coarse angular blocky; very firm; thin continuous dark gray (10YR 4/1) organic coatings on faces of peds; few medium strong brown (7.5YR 4/6) iron and manganese stains around old root channels and pores; neutral; clear smooth boundary.

Cg1—27 to 44 inches; light brownish gray (2.5Y 6/2) silty clay; common medium distinct light olive brown (2.5Y 5/4) mottles; massive; very firm; very dark gray (10YR 3/1) silty clay krotovinas; few medium strong brown (7.5YR 4/6) iron and manganese stains around old root channels and pores; few snail shells; strong effervescence; moderately alkaline; gradual smooth boundary.

Cg2—44 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; many coarse faint dark gray (10YR 4/1) and many medium distinct yellowish brown (10YR 5/6) mottles; massive; very firm; very dark gray (10YR 3/1) silty clay krotovinas; many coarse strong brown (7.5YR 4/6) iron and manganese stains around old root channels and pores; strong effervescence; moderately alkaline.

The solum is 26 to 42 inches thick. The Ap horizon has value of 2 or 3. The Bg horizon has value of 3 to 6. The Cg horizon is dominantly silty clay loam or silty clay. In many pedons, however, it has thin strata of fine sand, sandy loam, or loam.

Morley Series

The Morley series consists of deep, well drained, slowly permeable soils on till plains and moraines. These soils formed in glacial till. Slopes range from 6 to 18 percent.

Morley soils commonly are adjacent to Glynwood soils. The adjacent soils are grayer in the solum than the Morley soils. They are in the less sloping areas.

Typical pedon of Morley silty clay loam, 6 to 12 percent slopes, eroded, in a cultivated field; 1,580 feet west and 1,360 feet south of the northeast corner of sec. 15, T. 25 N., R. 14 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 17 inches; dark yellowish brown (10YR 4/4) clay; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; common fine roots; thin continuous brown (10YR 4/3) clay films and a few grayish brown (10YR 5/2) silt coatings on faces of peds; about 3 percent fine gravel; strongly acid; clear smooth boundary.

Bt2—17 to 20 inches; dark yellowish brown (10YR 4/4) clay; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; common fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; neutral; clear wavy boundary.

Bt3—20 to 29 inches; yellowish brown (10YR 5/4) clay loam; common medium faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

C—29 to 60 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; firm; about 5 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 20 to 48 inches thick. The Ap horizon has chroma of 1 or 2. It is silty clay loam or silt loam. The Bt horizon has chroma of 3 to 6. It is clay loam, silty clay loam, clay, or silty clay. It is neutral to strongly acid in the upper part and medium acid to mildly alkaline in the lower part. The C horizon is silty clay loam or clay loam.

Nappanee Series

The Nappanee series consists of deep, somewhat poorly drained, slowly permeable soils on moraines. These soils formed in glacial till. Slopes range from 0 to 3 percent.

Nappanee soils are similar to Blount soils and commonly are adjacent to Pewamo and St. Clair soils. Blount soils have less clay in the substratum than the Nappanee soils. Pewamo soils have a surface layer that is darker than that of the Nappanee soils and are grayer throughout the solum. They are in depressions. St. Clair soils are moderately well drained and are in the higher landscape positions.

Typical pedon of Nappanee silt loam, 0 to 3 percent slopes, in a cultivated field; 675 feet north and 350 feet east of the southwest corner of sec. 15, T. 28 N., R. 14 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common very fine roots; neutral; abrupt smooth boundary.

Btg—8 to 11 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; common very fine roots; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt1—11 to 17 inches; dark yellowish brown (10YR 4/4) clay; many coarse distinct dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few pebbles; strongly acid; clear smooth boundary.

Bt2—17 to 25 inches; dark yellowish brown (10YR 4/4) clay; common medium distinct grayish brown (10YR 5/2) and many coarse distinct dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; very firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few pebbles; slightly acid; clear smooth boundary.

BCg—25 to 36 inches; grayish brown (10YR 5/2) clay; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure parting to moderate coarse angular blocky; very firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

Cg—36 to 60 inches; grayish brown (10YR 5/2) clay; common medium distinct dark yellowish brown (10YR 4/4) and common medium distinct gray (5Y 5/1) mottles; massive; very firm; few pebbles; strong effervescence; moderately alkaline.

The solum is 22 to 40 inches thick. The Ap horizon has chroma of 2 or 3. It is dominantly silt loam, but the range includes loam. The Bt horizon has value of 4 to 6 and chroma of 2 to 4. It is dominantly silty clay or clay, but it has thin layers of silty clay loam. It is strongly acid to slightly acid in the upper part and slightly acid to mildly alkaline in the lower part. The C horizon is clay or silty clay.

Pewamo Series

The Pewamo series consists of deep, very poorly drained, moderately slowly permeable soils on till plains and moraines. These soils formed in glacial till. Slopes range from 0 to 2 percent.

These soils do not have an argillic horizon, which is definitive for the Pewamo series. This difference, however, does not alter usefulness or behavior of the soils.

Pewamo soils commonly are adjacent to Blount, Haskins, and Nappanee soils. The adjacent soils are somewhat poorly drained and are slightly higher on the landscape than the Pewamo soils.

Typical pedon of Pewamo silty clay, in a cultivated field; 350 feet north and 1,850 feet west of the southeast corner of sec. 4, T. 28 N., R. 15 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; very dark grayish brown (10YR 3/2) silty clay, grayish brown (10YR 5/2) dry; weak coarse subangular blocky structure; firm; few fine roots; neutral; abrupt smooth boundary.

Btg1—12 to 23 inches; gray (10YR 5/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) and few fine distinct dark gray (N 4/0) mottles; weak coarse prismatic structure parting to strong medium subangular blocky; firm; very dark grayish brown (10YR 3/2) silty clay loam krotovinas; thin patchy dark gray (10YR 4/1) clay films on faces of peds; few small pebbles; neutral; clear smooth boundary.

Btg2—23 to 30 inches; gray (10YR 5/1) silty clay; common medium distinct yellowish brown (10YR 5/6) and dark brown (10YR 4/3) mottles; weak coarse prismatic structure parting to strong medium subangular blocky; firm; very dark grayish brown (10YR 3/2) silty clay loam krotovinas; thin continuous dark gray (10YR 4/1) clay films on faces of peds; few small pebbles; mildly alkaline; clear smooth boundary.

Btg3—30 to 40 inches; gray (10YR 5/1) silty clay; many coarse distinct yellowish brown (10YR 5/6) and common medium prominent dark brown (10YR 4/3) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; very dark grayish brown (10YR 3/2) silty clay loam krotovinas; thin discontinuous dark gray (10YR 4/1) clay films

on faces of peds; few small pebbles; mildly alkaline; clear smooth boundary.

Btg4—40 to 46 inches; gray (10YR 5/1) silty clay; many coarse distinct yellowish brown (10YR 5/6) and few fine distinct dark brown (10YR 4/3) mottles; weak coarse subangular blocky structure; firm; very dark grayish brown (10YR 3/2) silty clay loam krotovinas; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; few small pebbles; mildly alkaline; gradual wavy boundary.

BC—46 to 55 inches; dark brown (10YR 4/3) silty clay; common medium distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; few small pebbles; slight effervescence; mildly alkaline; clear wavy boundary.

C—55 to 60 inches; dark brown (10YR 4/3) silty clay loam; common medium distinct gray (10YR 5/1) mottles; massive; firm; few small pebbles; strong effervescence; mildly alkaline.

The solum is 32 to 64 inches thick. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silty clay, but the range includes silty clay loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam, silty clay, or clay. It is slightly acid to mildly alkaline. The C horizon is clay loam or silty clay loam.

Rawson Series

The Rawson series consists of deep, moderately well drained soils on till plains and moraines. These soils formed in loamy material and in the underlying glacial till. Permeability is moderate in the upper part of the profile and slow in the lower part. Slopes range from 2 to 6 percent.

Rawson soils are similar to Martinsville soils and commonly are adjacent to Haskins soils. Martinsville soils are well drained. They have more sand in the substratum than the Rawson soils. Haskins soils are grayer than the Rawson soils. Also, they are in lower landscape positions.

Typical pedon of Rawson loam, 2 to 6 percent slopes, in a cultivated field; 1,450 feet north and 1,000 feet east of the southwest corner of sec. 22, T. 27 N., R. 15 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bt1—8 to 13 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; clay bridging between sand grains; friable; few fine roots; slightly acid; clear smooth boundary.

Bt2—13 to 24 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few very fine roots; thin continuous brown (10YR 5/3) clay films on faces of peds; slightly acid; clear wavy boundary.

2Bt3—24 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; thin discontinuous brown (10YR 5/3) clay films on faces of peds; medium acid; clear wavy boundary.

2Bt4—29 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few very fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; slightly acid; clear wavy boundary.

2Bt5—33 to 37 inches; yellowish brown (10YR 5/4) silty clay loam; common coarse distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; strong effervescence; moderately alkaline; clear wavy boundary.

2C—37 to 60 inches; brown (10YR 5/3) silty clay loam; massive; very firm; strong effervescence; moderately alkaline.

The solum is 26 to 41 inches thick. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is dominantly loam, but the range includes sandy loam. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is dominantly clay loam, but it has layers of sandy clay loam, loam, or sandy loam. It is neutral to strongly acid. The 2Bt and 2C horizons are silty clay loam or clay loam.

St. Clair Series

The St. Clair series consists of deep, moderately well drained, slowly permeable soils on till plains and moraines. These soils formed in glacial till. Slopes range from 3 to 8 percent.

These soils have a thicker solum than is defined as the range for the St. Clair series. Also, they are more acid in the upper part of the subsoil and have low-chroma mottles higher in the solum. These differences, however, do not alter the usefulness or behavior of the soils.

St. Clair soils are similar to Glynwood soils and commonly are adjacent to Morley and Nappanee soils. Glynwood and Morley soils have less clay in the lower part of the B horizon and in the C horizon than the St. Clair soils. Also, Morley soils are browner in the solum. They are in the more sloping areas. Nappanee soils are grayer in the solum than the St. Clair soils. They are in the lower landscape positions.

Typical pedon of St. Clair clay loam, 3 to 8 percent slopes, eroded, in a cultivated field; 225 feet north and 900 feet east of the center of sec. 1, T. 27 N., R. 14 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) clay loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt wavy boundary.

Bt1—8 to 12 inches; brown (10YR 4/3) clay; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous dark brown (10YR 3/3) clay films and thin continuous brown (10YR 5/3) silt coatings on faces of peds; few pebbles; very strongly acid; clear smooth boundary.

Bt2—12 to 18 inches; dark yellowish brown (10YR 4/4) clay; common medium distinct dark grayish brown (10YR 4/2) and few fine distinct olive gray (5Y 5/2) mottles; weak medium prismatic structure parting to strong medium subangular blocky; very firm; few fine and coarse roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few pebbles; strongly acid; clear wavy boundary.

Bt3—18 to 27 inches; dark yellowish brown (10YR 4/4) clay; many medium distinct dark grayish brown (10YR 4/2) mottles; weak medium prismatic structure parting to strong medium subangular blocky; very firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few pebbles; mildly alkaline; gradual smooth boundary.

Bt4—27 to 36 inches; dark yellowish brown (10YR 4/4) silty clay; many medium distinct dark grayish brown (10YR 4/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few pebbles; slight effervescence; moderately alkaline; gradual wavy boundary.

C—36 to 60 inches; dark yellowish brown (10YR 4/4) silty clay; massive; very firm; few pebbles; strong effervescence; moderately alkaline.

The solum is 22 to 40 inches thick. The Ap horizon has chroma of 2 or 3. It is dominantly clay loam, but the range includes silt loam and silty clay loam. The Bt horizon has value of 4 or 5 and chroma of 3 or 4 and has low-chroma mottles in the lower part. It is clay or silty clay. It is medium acid to very strongly acid in the upper part and slightly acid to moderately alkaline in the lower part. The C horizon is silty clay or clay.

Saranac Series

The Saranac series consists of deep, very poorly drained, moderately slowly permeable soils on bottom lands. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Saranac soils are similar to Sloan soils and commonly are adjacent to Armiesburg and Tice soils. Sloan soils have less clay in the solum than the Saranac soils. Armiesburg and Tice soils are better drained than the Saranac soils and are in slightly higher landscape positions.

Typical pedon of Saranac clay, frequently flooded, in a cultivated field; 800 feet north and 450 feet west of the southeast corner of sec. 11, T. 25 N., R. 13 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; firm; common fine roots; neutral; abrupt smooth boundary.

A—9 to 12 inches; very dark grayish brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; firm; common fine roots; few pebbles; neutral; abrupt smooth boundary.

Bg1—12 to 18 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; common fine distinct yellowish brown (10YR 5/6) and few fine distinct strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; firm; few fine roots; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; few pebbles; neutral; gradual wavy boundary.

Bg2—18 to 24 inches; dark gray (10YR 4/1) clay; common medium distinct olive brown (2.5Y 4/4) and few fine distinct light olive brown (2.5Y 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; few pebbles; neutral; gradual wavy boundary.

Bg3—24 to 38 inches; dark gray (10YR 4/1) clay; many medium distinct olive brown (2.5Y 4/4) and common medium distinct dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; firm; few fine roots; very dark grayish brown (10YR 3/2) silty clay krotovina 3 inches wide; thin discontinuous dark gray (10YR 4/1) organic coatings on faces of peds; neutral; gradual wavy boundary.

Cg1—38 to 51 inches; gray (10YR 5/1) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; very dark grayish brown (10YR 3/2) silty clay krotovina 3 inches wide; about 5 percent gravel; neutral; clear irregular boundary.

Cg2—51 to 60 inches; dark grayish brown (10YR 4/2) loam that has thin strata of sandy loam and clay loam; common medium distinct yellowish brown (10YR 5/8) and dark yellowish brown (10YR 4/4) mottles; massive; firm; very dark grayish brown (10YR 3/2) silty clay krotovina 3 inches wide; about 10 percent gravel; slight effervescence; moderately alkaline.

The solum is 27 to 60 inches thick. The Ap horizon has chroma of 1 or 2. The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is clay loam, clay, or silty clay loam. The C horizon is dominantly clay loam, silt loam, or loam. In many

pedons, however, it has thin strata of sandy loam, fine sand, sandy clay loam, or silty clay.

Shoals Series

The Shoals series consists of deep, somewhat poorly drained, moderately permeable soils on bottom lands. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Shoals soils are similar to Tice soils and commonly are adjacent to Chagrin and Sloan soils. Tice soils have a dark surface layer and have less sand in the solum than the Shoals soils. Chagrin soils are well drained and are in the slightly higher landscape positions. Sloan soils have a dark surface layer and are grayer throughout the solum than the Shoals soils. They are in the lower landscape positions.

Typical pedon of Shoals clay loam, frequently flooded, in a cultivated field; 260 feet south and 840 feet west of the center of sec. 18, T. 27 N., R. 15 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) clay loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

Cg1—9 to 12 inches; dark grayish brown (10YR 4/2) clay loam, light brownish gray (10YR 6/2) dry; moderate medium angular blocky structure; firm; few fine roots; slightly acid; abrupt smooth boundary.

Cg2—12 to 21 inches; grayish brown (10YR 5/2) loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; clear smooth boundary.

Cg3—21 to 28 inches; brown (10YR 5/3) clay loam; many coarse faint grayish brown (10YR 5/2) and distinct yellowish brown (10YR 5/8) mottles; moderate medium angular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) organic coatings on faces of peds; few fine black (N 2/0) iron and manganese oxide accumulations; neutral; clear smooth boundary.

Cg4—28 to 45 inches; brown (10YR 4/3) sandy clay loam; many coarse distinct yellowish brown (10YR 5/8) and common coarse faint dark grayish brown (10YR 4/2) mottles; weak coarse subangular blocky structure; firm; thin continuous dark gray (10YR 4/1) coatings on faces of peds; few fine black (N 2/0) iron and manganese oxide accumulations; neutral; clear smooth boundary.

Cg5—45 to 57 inches; dark grayish brown (10YR 4/2) sandy clay loam; many coarse distinct yellowish brown (10YR 5/8) and faint very dark grayish brown (10YR 3/2) mottles; massive; firm; few fine black (N 2/0) iron and manganese oxide accumulations; neutral; clear smooth boundary.

Cg6—57 to 60 inches; dark grayish brown (10YR 4/2) fine sandy loam that has thin strata of loam, silty clay loam, and fine sand; many coarse distinct yellowish brown (10YR 5/8) and faint brown (10YR 4/3) mottles; massive; very friable; slight effervescence; mildly alkaline.

The A horizon is clay loam, silty clay loam, or silt loam. The C horizon is dominantly clay loam or sandy clay loam, but it has individual subhorizons of fine sandy loam, loam, silt loam, or silty clay loam. It is neutral to moderately alkaline.

Sloan Series

The Sloan series consists of deep, very poorly drained, moderately permeable soils on bottom lands. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Sloan soils are similar to Saranac soils and commonly are adjacent to Shoals soils. Saranac soils have more clay in the solum than the Sloan soils. Shoals soils are somewhat poorly drained and are in the slightly higher landscape positions.

Typical pedon of Sloan loam, frequently flooded, in a cultivated field; 680 feet east and 600 feet north of the center of sec. 12, T. 27 N., R. 14 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak coarse angular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

Bg1—13 to 19 inches; dark gray (10YR 4/1) clay loam; few fine faint dark brown (10YR 4/3) mottles; weak fine subangular blocky structure; friable; few fine roots; thin continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; gradual smooth boundary.

Bg2—19 to 28 inches; dark gray (10YR 4/1) clay loam; common fine faint dark brown (10YR 4/3) mottles; weak medium subangular blocky structure; firm; few fine roots; thin continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.

Bg3—28 to 33 inches; gray (10YR 5/1) clay loam; many fine distinct light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; firm; few fine roots; thin patchy very dark grayish brown (10YR 3/2) organic coatings on vertical faces of peds; neutral; clear smooth boundary.

Bg4—33 to 45 inches; gray (10YR 5/1) sandy clay loam; many fine distinct light olive brown (2.5Y 5/4) mottles; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

Cg—45 to 60 inches; grayish brown (10YR 5/2) stratified sandy loam and loam; common fine faint brown (10YR 5/3) mottles; massive; very friable; slight effervescence; mildly alkaline.

The solum is 30 to 50 inches thick. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly loam, but the range includes silt loam and silty clay loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It is clay loam, sandy clay loam, loam, or silty clay loam.

Tice Series

The Tice series consists of deep, somewhat poorly drained, moderately permeable soils on bottom lands. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Tice soils are similar to Shoals soils and commonly are adjacent to Armiesburg and Saranac soils. Shoals soils have a surface layer that is lighter colored than that of the Tice soils and contain more sand in the solum. Armiesburg soils are well drained and are in the slightly higher landscape positions. Saranac soils are grayer in the solum than the Tice soils. They are in the lower landscape positions.

Typical pedon of Tice silty clay loam, frequently flooded, in a cultivated field; 1,500 feet north and 200 feet west of the southeast corner of sec. 12, T. 27 N., R. 14 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine and very fine subangular blocky structure; friable; many fine roots; mildly alkaline; abrupt smooth boundary.

A—7 to 12 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate coarse angular blocky structure; firm; many fine roots; neutral; abrupt smooth boundary.

Bw1—12 to 17 inches; dark brown (10YR 3/3) silty clay loam; many medium faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) organic coatings on faces of peds; neutral; gradual smooth boundary.

Bw2—17 to 30 inches; brown (10YR 4/3) silty clay loam; few medium distinct strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) coatings on faces of peds; few fine black (N 2/0) iron and manganese oxide accumulations; slightly acid; clear smooth boundary.

Bw3—30 to 35 inches; dark yellowish brown (10YR 4/4) clay loam; few medium distinct strong brown (7.5YR 4/6) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) coatings on faces of peds; few fine black (N 2/0) iron and manganese oxide accumulations; slightly acid; clear smooth boundary.

Bw4—35 to 51 inches; dark yellowish brown (10YR 4/4) clay loam; many coarse distinct yellowish brown (10YR 5/6) and few medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous brown (10YR 5/3) organic coatings on faces of peds; few fine black (N 2/0) iron and manganese oxide accumulations; slightly acid; clear smooth boundary.

C—51 to 60 inches; dark brown (10YR 4/3) sandy loam that has thin strata of sandy clay loam, clay loam, and loam; many coarse distinct brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; massive; firm; thin layer of gravel at a depth of about 52 inches; about 5 percent gravel; slight effervescence; mildly alkaline.

The solum is 30 to 60 inches thick. The A horizon has chroma of 2 or 3. It is dominantly silty clay loam, but the range includes silt loam. The B horizon has value of 3 to 5 and chroma of 2 to 4. The C horizon is dominantly sandy loam, clay loam, or silty clay loam. In many pedons, however, it has thin strata of sandy clay loam, fine sand, or loam.

Whitaker Series

The Whitaker series consists of deep, somewhat poorly drained, moderately permeable soils on terraces. These soils formed in stratified, loamy deposits. Slopes range from 0 to 2 percent.

Whitaker soils are similar to Haskins soils and commonly are adjacent to Martinsville and Milford soils. Haskins soils do not have a stratified substratum. Martinsville soils are well drained and are in the higher landscape positions. Milford soils are grayer than the Whitaker soils. They are in the slightly lower landscape positions.

Typical pedon of Whitaker silt loam, in a cultivated field; 530 feet east and 220 feet north of the center of sec. 2, T. 27 N., R. 14 E.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and very fine roots; slightly acid; abrupt smooth boundary.

E—11 to 16 inches; grayish brown (10YR 5/2) loam, light brownish gray (10YR 6/2) dry; few medium distinct pale brown (10YR 6/3) mottles; weak thick platy structure; friable; common very fine roots; slightly acid; clear smooth boundary.

Bt—16 to 24 inches; pale brown (10YR 6/3) loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to

moderate medium angular blocky; friable; common very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

Btg1—24 to 39 inches; gray (10YR 5/1) clay loam; many coarse prominent yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; common very fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; medium acid; clear wavy boundary.

Btg2—39 to 53 inches; dark gray (10YR 4/1) sandy clay loam; many coarse distinct yellowish brown (10YR 5/6) and common coarse distinct dark brown (10YR 4/3) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; medium acid; clear smooth boundary.

Cg—53 to 60 inches; dark gray (10YR 4/1) clay loam that has thin strata of silty clay loam and fine sand; many coarse distinct dark brown (10YR 4/3) and common coarse distinct yellowish brown (10YR 5/6) mottles; massive; firm; slightly acid.

The solum is 36 to 53 inches thick. The Ap horizon has chroma of 2 or 3. The Bt horizon has chroma of 1 to 4. It is dominantly clay loam, but it has layers of loam, sandy clay loam, and silty clay loam.

Formation of the Soils

The paragraphs that follow relate the major factors of soil formation to the soils in Adams County. They also describe several processes of soil formation.

Factors of Soil Formation

Soil forms through processes acting on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material accumulated and has existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always needed for the differentiation of soil horizons. Usually, a long time is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. The parent materials of most of the soils in Adams County were deposited by glaciers or by melt water from the glaciers. Some of these materials were subsequently reworked and redeposited by water and wind. The glaciers covered the county for thousands of years and finally retreated about 15,000 years ago. Although of glacial origin, the materials vary greatly, sometimes within small areas, depending on how they were deposited. The dominant parent materials in Adams County were deposited as glacial till, outwash deposits, lacustrine deposits, alluvium, and organic material.

Glacial till is material that was laid down directly by glacial ice with a minimum of water action. It consists of particles of different sizes mixed together. The small pebbles in glacial till have some sharp corners, indicating that they have not been worn by water. The glacial till in Adams County is calcareous, firm silty clay loam or clay loam. An example of soils that formed in glacial till are those in the Glynwood series. These soils typically are moderately fine textured and have well developed structure.

Outwash material was deposited by running water from melting glaciers. The size of the particles in outwash material varies according to the velocity of the water. When rapidly moving water slowed down, the coarser particles were deposited first. Finer particles, such as very fine sand, silt, and clay, were carried farther by the more slowly moving water. Outwash deposits generally consist of layers of particles of similar size, such as sandy loam, sand, gravel, and other coarse particles. Martinsville soils formed in deposits of outwash material in Adams County.

Lacustrine material was deposited from still, or ponded, glacial melt water. Because the coarser particles had dropped out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remained to settle out in still water. Lacustrine deposits are silty or clayey. The soils in Adams County that formed in lacustrine deposits typically are moderately fine textured. Milford soils are an example.

Alluvial material was deposited by floodwater along the present streams. It varies in texture, depending on the speed of the water from which it was deposited. The alluvial material deposited along a swift stream is coarser textured than that deposited along a slow, sluggish stream. Tice soils are examples of alluvial soils.

Organic material is made up of deposits of plant remains. After the glaciers withdrew from the area, water was left standing in depressions in outwash plains, lake plains, and till plains. Grasses and sedges growing around the edges of these lakes died, and their remains fell to the bottom. Because the areas were wet, the plant remains did not decompose but remained around the edge of the lakes. Later, white-cedar and other water-tolerant trees grew in the areas. As these trees died, their residues became part of the organic accumulation. The lakes were eventually filled with organic material. In some of these areas, the plant remains subsequently

decomposed to form muck. In other areas, the material has changed little since deposition and remains as peat. Houghton soils formed in organic material.

Plant and Animal Life

Plants have been the principal kind of organism influencing the soils in Adams County; however, bacteria, fungi, earthworms, and human activities also have been important. The chief contribution of plant and animal life to soil formation is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kinds of native plants that grew on the soil. The remains of these plants accumulated on the surface, decayed, and eventually became organic matter. Their roots provided channels for the downward movement of water through the soil and added organic matter as they decayed. Bacteria in the soil help to break down the organic matter into plant nutrients.

The native vegetation in Adams County was mainly deciduous trees. Differences in natural soil drainage and minor variations in the parent material affected the composition of the forests. In general, the well drained upland soils, such as Morley soils, were covered by sugar maple, beech, white oak, walnut, and hickory. The trees on the wet soils were primarily willow and soft maple. A few wet soils also supported sphagnum and other mosses, which contributed substantially to the accumulation of organic matter. Pewamo soils formed under wet conditions and contain relatively large amounts of organic matter.

Climate

Climate has important effects on the formation of soils. It determines the kind of plant and animal life on and in the soil. It determines the amount of water available for the weathering of minerals and the transporting of weathered products. Through its influence on soil temperature, it determines the rate of chemical reactions in the soil. These influences tend to be uniform throughout areas the size of a county.

The climate in Adams County is cool and humid. It is presumed to be similar to the climate that prevailed when the soils formed. The soils in this county differ from soils that formed under a dry, warm climate and from those that formed under a hot, moist climate. Although climate is uniform throughout the county, its effect is modified locally by runoff and landscape position. Therefore, the differences among the soils in Adams County result, to a minor extent, from differences in climate. More detailed information about the climate is given in the section "General Nature of the County."

Relief

Relief has had a marked effect on the soils in Adams County through its influence on natural soil drainage, runoff, erosion, plant cover, and soil temperature. The soils range from well drained on side slopes to very poorly drained in depressions. Through its effect on aeration, drainage helps to determine the color of the soil. Runoff is most rapid on the steeper slopes. In low areas water is temporarily ponded. Water and air move freely through well drained soils and slowly through very poorly drained soils. In soils that are well aerated, the iron compounds that give most soils their color are brightly colored and oxidized. Poorly aerated soils are dull gray and mottled. Martinsville soils are an example of well drained, well aerated soils, and Milford soils are an example of poorly aerated, very poorly drained soils.

Time

Time, usually a long time, is required for distinct horizons to form in the parent material. Differences in the length of time that the parent materials have been in place are commonly reflected in the degree of profile development. Some soils form rapidly, and others form slowly. Tice soils are an example of young soils that formed in alluvial material.

Martinsville and Milford soils are older soils that show the effect of time on the leaching of lime within the profile. The solum of these soils originally had about as much lime as their C horizon does now. The Milford soils were submerged under glacial lakes for some time and thus were protected from leaching. In contrast, the Martinsville soils were above water and subject to leaching for much longer. The difference in time is reflected in the difference in the extent of leaching. The Martinsville soils are leached to a depth of 65 inches, whereas the Milford soils generally have carbonates at a depth of 35 inches.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in this county. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; the liberation and translocation of silicate clay minerals; and gleying. In most soils more than one of these processes have been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all the soils in this county. The content of organic matter in some soils is low, but that of others is high. Generally, the soils that have the most organic matter, such as Milford and Montgomery soils, have a thick, dark surface layer.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in this county. Leaching generally precedes the translocation of silicate clay minerals. Nearly all of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and

by an acid reaction. Leaching of wet soils is slow because of a seasonal high water table or the slow movement of water through the profile.

Clay accumulates in pores and other voids and forms films on the surfaces along which water moves. The leaching of bases and the translocation of silicate clays are among the more important processes of horizon differentiation in this county. In Morley soils, for example, translocated silicate clays have accumulated in the Bt horizon as clay films on the faces of peds.

Gleying—the reduction and transfer of iron—has occurred in all of the very poorly drained and somewhat poorly drained soils in this county. In the naturally wet soils, this process has been significant in horizon differentiation. A gray color in the subsoil indicates the reduction and redistribution of iron oxides. Reduction is commonly accompanied by some transfer of the iron, either from the upper horizons to the lower ones or completely out of the profile. Mottles, which are in some horizons, indicate the segregation of iron.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and

resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C

horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material).

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size

of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Much has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the

underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded in the period 1951-74 at Berne, Indiana]

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days*	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	34.0	18.4	26.2	60	-10	16	2.20	1.14	3.12	6	6.8
February---	37.3	20.4	28.8	61	-8	11	1.93	.90	2.81	5	5.9
March------	47.3	29.1	38.3	78	3	142	3.16	1.43	4.63	7	7.0
April------	60.8	39.3	50.1	84	22	314	3.24	1.96	4.39	7	1.2
May--------	72.1	48.7	60.4	89	29	632	3.68	2.82	4.48	8	.0
June-------	82.5	58.8	70.7	96	41	921	4.12	2.38	5.66	7	.0
July-------	84.9	62.5	73.8	97	47	1,048	4.26	2.88	5.52	7	.0
August-----	83.9	60.4	72.2	96	42	998	2.93	1.56	4.13	5	.0
September--	77.9	54.0	66.0	95	36	780	3.31	1.36	4.95	6	.0
October----	66.3	43.2	54.8	87	23	465	2.36	1.07	3.47	5	.0
November---	50.1	33.5	41.8	73	12	115	2.86	1.44	4.10	6	2.0
December---	37.5	23.0	30.3	65	-6	40	2.31	.88	3.49	6	6.2
Yearly:											
Average--	61.2	40.9	51.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-15	---	---	---	---	---	---
Total----	---	---	---	---	---	5,482	36.36	29.91	39.36	75	29.1

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-74 at Berne, Indiana]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 17	April 28	May 16
2 years in 10 later than--	April 12	April 23	May 11
5 years in 10 later than--	April 4	April 14	May 2
First freezing temperature in fall:			
1 year in 10 earlier than--	October 20	October 12	September 30
2 years in 10 earlier than--	October 25	October 18	October 5
5 years in 10 earlier than--	November 4	October 28	October 14

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1951-74 at Berne, Indiana]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	194	175	148
8 years in 10	201	182	153
5 years in 10	214	196	165
2 years in 10	227	210	176
1 year in 10	234	217	182

TABLE 4.--POTENTIALS AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Extent	Cultivated crops	Specialty crops	Woodland	Urban uses	Intensive recreation areas	Extensive recreation areas
	Pct						
1. Blount-Pewamo	73	Good	Fair: wetness.	Good	Poor: wetness, permeability, ponding.	Poor: wetness, ponding.	Fair: wetness, ponding.
2. Glynwood-Blount	15	Good	Fair: wetness, erosion.	Good	Poor: wetness, permeability.	Fair: wetness.	Good.
3. Saranac-Tice-Sloan	7	Fair: flooding, wetness.	Poor: flooding, wetness.	Fair: flooding, wetness.	Poor: flooding, wetness.	Poor: flooding, wetness.	Poor: flooding, wetness.
4. Nappanee-St. Clair	5	Fair: slope, erosion.	Fair: wetness, erosion.	Good	Poor: wetness, permeability, shrink-swell.	Fair: wetness, too clayey.	Good.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Am	Armiesburg silty clay loam, frequently flooded	710	0.3
BcA	Blount silt loam, 0 to 1 percent slopes	51,000	23.4
BcB	Blount silt loam, 1 to 4 percent slopes	42,250	19.4
Ch	Chagrin loam, frequently flooded	450	0.2
GoB	Glynwood silt loam, 3 to 8 percent slopes	12,550	5.8
HaA	Haskins loam, 1 to 3 percent slopes	1,370	0.6
Ho	Houghton muck, drained	900	0.4
McA	Martinsville loam, 0 to 2 percent slopes	400	0.2
McB	Martinsville loam, 2 to 6 percent slopes	660	0.3
Mh	Milford silty clay loam	4,210	1.9
Mk	Montgomery silty clay	475	0.2
MoC2	Morley silty clay loam, 6 to 12 percent slopes, eroded	1,790	0.8
MoD2	Morley silty clay loam, 12 to 18 percent slopes, eroded	285	0.1
Na	Nappanee silt loam, 0 to 3 percent slopes	4,410	2.0
Pm	Pewamo silty clay	79,600	36.6
Px	Pits	215	0.1
RdB	Rawson loam, 2 to 6 percent slopes	990	0.5
SaB2	St. Clair clay loam, 3 to 8 percent slopes, eroded	1,900	0.9
Sc	Saranac clay, frequently flooded	4,310	2.0
Sh	Shoals clay loam, frequently flooded	1,200	0.6
Sl	Sloan loam, frequently flooded	1,200	0.6
Tc	Tice silty clay loam, frequently flooded	3,200	1.5
Ud	Udorthents, loamy	910	0.4
Wh	Whitaker silt loam	1,860	0.9
	Water <40 acres in size	665	0.3
	Water >40 acres in size	45	*
	Total	217,555	100.0

* Less than 0.1 percent.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Am: Armiesburg	IIw	110	42	47	3.8	8.8
BcA: Blount	IIw	106	35	48	4.3	7.2
BcB: Blount	IIe	105	35	47	4.3	7.1
Ch: Chagrin	IIw	115	35	33	4.5	9.0
GoB: Glynwood	IIe	105	35	40	4.5	9.0
HaA: Haskins	IIw	110	44	46	4.4	8.8
Ho: Houghton	IIIw	115	34	---	---	---
McA: Martinsville	I	115	40	46	3.8	7.6
McB: Martinsville	IIe	115	40	46	3.8	7.6
Mh: Milford	IIw	131	48	56	5.2	10.4
Mk: Montgomery	IIIw	115	40	52	3.8	7.6
MoC2: Morley	IIIe	97	33	44	4.0	8.0
MoD2: Morley	IVe	87	---	39	3.6	7.2
Na: Nappanee	IIIw	110	32	50	3.5	7.0
Pm: Pewamo	IIw	125	42	60	5.0	10.0
Px**. Pits						
RdB: Rawson	IIe	105	38	46	4.2	8.4
SaB2: St. Clair	IIIe	80	25	35	4.0	8.0
Sc: Saranac	IIIw	110	38	---	3.5	6.7
Sh: Shoals	IIw	80	32	33	3.0	8.0
Sl: Sloan	IIIw	110	35	---	4.0	8.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Tc------------------------- Tice	IIIw	92	28	33	3.4	6.8
Ud**. Udorthents						
Wh------------------------- Whitaker	IIw	130	46	52	4.3	8.6

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	400	---	---	---
II	199,960	56,450	143,510	---
III	13,875	3,690	10,185	---
IV	1,485	285	1,200	---
V	---	---	---	---
VI	---	---	---	---
VII	---	---	---	---
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Am----------------- Armiesburg	1a	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, black walnut, yellow-poplar, black locust.
						White oak-----------	90	
						Black walnut--------	70	
BcA, BcB----------- Blount	3c	Slight	Slight	Severe	Severe	White oak-----------	65	Eastern white pine, yellow-poplar.
						Northern red oak----	65	
						Green ash-----------	---	
						Bur oak-------------	---	
						Pin oak-------------	---	
Ch----------------- Chagrin	1a	Slight	Slight	Slight	Slight	Northern red oak----	86	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
						Yellow-poplar-------	96	
						Sugar maple---------	86	
						White oak-----------	---	
						Black cherry--------	---	
						White ash-----------	---	
						Black walnut--------	---	
GoB---------------- Glynwood	2c	Slight	Slight	Moderate	Moderate	Northern red oak----	80	Austrian pine, yellow-poplar, green ash, pin oak, red maple, black oak.
						Black oak-----------	80	
						White oak-----------	80	
						Red maple-----------	---	
						Slippery elm--------	---	
						Black cherry--------	---	
						White ash-----------	---	
HaA---------------- Haskins	2a	Slight	Slight	Slight	Slight	White oak-----------	75	Green ash, white ash, eastern white pine, yellow-poplar, black cherry, northern red oak, white oak, black locust.
						Northern red oak----	80	
						Pin oak-------------	90	
						Yellow-poplar-------	---	
						Black cherry--------	---	
						Sugar maple---------	---	
						White ash-----------	---	
Ho----------------- Houghton	4w	Slight	Severe	Severe	Severe	White ash-----------	51	
						Red maple-----------	51	
						Black willow--------	---	
						Quaking aspen-------	56	
						Silver maple--------	76	
McA, McB----------- Martinsville	1a	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.
						Yellow-poplar-------	98	
Mk----------------- Montgomery	2w	Slight	Severe	Severe	Severe	Pin oak-------------	88	Eastern white pine, red maple, white ash.
						White oak-----------	75	
MoC2--------------- Morley	2a	Slight	Slight	Slight	Slight	White oak-----------	80	White oak, black walnut, green ash, eastern white pine, red pine.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
						Bur oak-------------	---	
						Shagbark hickory----	---	
MoD2--------------- Morley	2r	Moderate	Moderate	Slight	Slight	White oak-----------	80	White oak, black walnut, green ash, eastern white pine, red pine.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
						Bur oak-------------	---	
						Shagbark hickory----	---	
Na----------------- Nappanee	3c	Slight	Moderate	Severe	Severe	White oak-----------	75	Eastern white pine, white ash, red maple, yellow-poplar.
						Pin oak-------------	85	
						American sycamore---	---	

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Pm------------------ Pewamo	2w	Slight	Severe	Moderate	Moderate	Pin oak-------------- Swamp white oak----- Red maple------------ White ash------------ Eastern cottonwood-- Green ash------------	90 --- 71 71 98 ---	White ash, eastern white pine, red maple, green ash.
RdB----------------- Rawson	2a	Slight	Slight	Slight	Slight	White oak------------ Northern red oak---- Yellow-poplar------- Black cherry-------- Sugar maple--------- White ash------------	75 80 --- --- --- ---	Eastern white pine, yellow-poplar, black cherry, white ash, red pine, white oak, northern red oak, green ash, black locust.
SaB2---------------- St. Clair	3c	Slight	Slight	Severe	Severe	Northern red oak---- White oak------------ White ash------------ Sugar maple---------	66 62 --- ---	Eastern white pine, yellow-poplar.
Sc------------------ Saranac	2w	Slight	Severe	Severe	Severe	Pin oak-------------- Red maple------------ Bur oak-------------- White ash------------	85 --- --- ---	Eastern white pine, red maple, white ash.
Sh------------------ Shoals	2w	Slight	Moderate	Moderate	Slight	Pin oak-------------- Yellow-poplar------- Virginia pine------- Eastern cottonwood-- White ash------------	90 90 90 --- ---	Red maple, swamp chestnut oak, pin oak, yellow-poplar.
Sl------------------ Sloan	2w	Slight	Severe	Severe	Severe	Pin oak-------------- Swamp white oak----- Red maple------------ Green ash------------ Eastern cottonwood--	86 --- --- --- ---	Red maple, green ash, pin oak, swamp white oak, silver maple.
Tc------------------ Tice	2a	Slight	Slight	Slight	Slight	Pin oak-------------- Yellow-poplar------- Virginia pine------- Eastern cottonwood-- White ash------------	96 90 90 --- ---	Green ash, yellow-poplar, red maple.
Wh------------------ Whitaker	3a	Slight	Slight	Slight	Slight	White oak------------ Pin oak-------------- Yellow-poplar------- Northern red oak----	70 85 85 75	Eastern white pine, white ash, red maple, yellow-poplar.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Am----------------- Armiesburg	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
BcA, BcB----------- Blount	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
Ch----------------- Chagrin	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
GoB---------------- Glynwood	---	Amur honeysuckle, Washington hawthorn, Amur privet, arrow-wood, eastern redcedar, Tatarian honey-suckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
HaA---------------- Haskins	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Ho----------------- Houghton	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
McA, McB----------- Martinsville	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Mh----------------- Milford	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Mk: Montgomery	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
MoC2, MoD2: Morley	---	Amur honeysuckle, Washington hawthorn, eastern redcedar, Amur privet, arrowwood, American cranberrybush, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Na: Nappanee	---	Eastern redcedar, Washington hawthorn, Amur privet, American cranberrybush, arrowwood, Amur honeysuckle, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Pm: Pewamo	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Px*. Pits					
RdB: Rawson	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
SaB2: St. Clair	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Sc: Saranac	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, northern white-cedar, Washington hawthorn, Norway spruce, blue spruce.	Eastern white pine	Pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Sh----------------- Shoals	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Sl----------------- Sloan	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Tc----------------- Tice	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Ud*. Udorthents					
Wh----------------- Whitaker	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, Washington hawthorn, northern white-cedar.	Norway spruce-----	Eastern white pine, pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Am: Armiesburg	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
BcA, BcB: Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ch: Chagrin	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
GoB: Glynwood	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, slope, percs slowly.	Moderate: wetness.	Slight.
HaA: Haskins	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Ho: Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
McA: Martinsville	Slight	Slight	Slight	Slight	Slight.
McB: Martinsville	Slight	Slight	Moderate: slope.	Slight	Slight.
Mh: Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Mk: Montgomery	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, percs slowly.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
MoC2: Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MoD2: Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Na: Nappanee	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Pm: Pewamo	Severe: too clayey, ponding.	Severe: too clayey, ponding.	Severe: too clayey, ponding.	Severe: too clayey, ponding.	Severe: too clayey, ponding.
Px*. Pits					
RdB: Rawson	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
SaB2: St. Clair	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Sc: Saranac	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.	Severe: wetness, flooding, too clayey.
Sh: Shoals	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Sl: Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Tc: Tice	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
Ud*. Udorthents					
Wh: Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Am: Armiesburg	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
BcA: Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BcB: Blount	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ch: Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GoB: Glynwood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HaA: Haskins	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ho: Houghton	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
McA, McB: Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Mh: Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Mk: Montgomery	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
MoC2: Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MoD2: Morley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Na: Nappanee	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Pm: Pewamo	Good	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
Px*. Pits										
RdB: Rawson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SaB2: St. Clair	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Sc: Saranac	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Sh: Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Sl: Sloan	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
Tc: Tice	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Ud*. Udorthents										
Wh----------------- Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Am: Armiesburg	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.
BcA, BcB: Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ch: Chagrin	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
GoB: Glynwood	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: frost action, low strength.	Slight.
HaA: Haskins	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Ho: Houghton	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
McA: Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action, shrink-swell.	Slight.
McB: Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action, shrink-swell.	Slight.
Mh: Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Mk: Montgomery	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding, too clayey.
MoC2: Morley	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
MoD2: Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Na: Nappanee	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness, droughty.
Pm: Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: too clayey, ponding.
Px*. Pits						

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
RdB: Rawson	Moderate: too clayey, dense layer, wetness.	Slight	Moderate: wetness, shrink-swell.	Moderate: slope.	Moderate: frost action.	Slight.
SaB2: St. Clair	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Sc: Saranac	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding, too clayey.
Sh: Shoals	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
Sl: Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Tc: Tice	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: flooding.
Ud*. Udorthents						
Wh: Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Am------------------- Armiesburg	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: hard to pack.
BcA, BcB------------ Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ch------------------ Chagrin	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Good.
GoB----------------- Glynwood	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
HaA----------------- Haskins	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Ho------------------ Houghton	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
McA, McB------------ Martinsville	Slight------------	Severe: seepage.	Severe: seepage.	Slight------------	Fair: too clayey.
Mh------------------ Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Mk------------------ Montgomery	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
MoC2---------------- Morley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MoD2---------------- Morley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Na------------------ Nappanee	Severe: wetness, percs slowly.	Slight------------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Pm------------------ Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
Px*. Pits					
RdB----------------- Rawson	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SaB2: St. Clair	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Sc: Saranac	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Sh: Shoals	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Sl: Sloan	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Tc: Tice	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Ud*. Udorthents					
Wh: Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Am: Armiesburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
BcA, BcB: Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ch: Chagrin	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
GoB: Glynwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
HaA: Haskins	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Ho: Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
McA, McB: Martinsville	Good	Probable	Probable	Good.
Mh: Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mk: Montgomery	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
MoC2: Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MoD2: Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Na: Nappanee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pm: Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
Px*. Pits				
RdB: Rawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
SaB2: St. Clair	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Sc: Saranac	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Sh: Shoals	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sl--------------------- Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Tc--------------------- Tice	Fair: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Ud*. Udorthents				
Wh--------------------- Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Am----------------- Armiesburg	Moderate: seepage.	Moderate: hard to pack.	Severe: no water.	Deep to water	Favorable------	Favorable.
BcA---------------- Blount	Slight----------	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
BcB---------------- Blount	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
Ch----------------- Chagrin	Moderate: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Favorable------	Favorable.
GoB---------------- Glynwood	Moderate: slope.	Moderate: wetness, piping.	Severe: no water.	Slope, percs slowly, frost action.	Erodes easily, wetness.	Erodes easily.
HaA---------------- Haskins	Moderate: seepage.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
Ho----------------- Houghton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, subsides, ponding.	Ponding, soil blowing.	Wetness.
McA---------------- Martinsville	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Soil blowing---	Favorable.
McB---------------- Martinsville	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Soil blowing---	Favorable.
Mh----------------- Milford	Slight----------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Mk----------------- Montgomery	Slight----------	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
MoC2, MoD2--------- Morley	Severe: slope.	Slight----------	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Na----------------- Nappanee	Slight----------	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly---	Erodes easily, wetness.	Wetness, erodes easily.
Pm----------------- Pewamo	Slight----------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding---------	Wetness.
Px*. Pits						
RdB---------------- Rawson	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Wetness, percs slowly.	Percs slowly.
SaB2--------------- St. Clair	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Sc----------------- Saranac	Slight---------	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, rooting depth, percs slowly.
Sh----------------- Shoals	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Sl----------------- Sloan	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Tc----------------- Tice	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness---------	Wetness.
Ud*. Udorthents						
Wh----------------- Whitaker	Moderate: seepage.	Severe: wetness.	Moderate: slow refill, cutbanks cave.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Am---------------- Armiesburg	0-20	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
	20-60	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
BcA, BcB--------- Blount	0-9	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	9-39	Silty clay loam, silty clay, clay loam, clay.	CH, CL	A-7, A-6	0-5	95-100	90-100	80-90	75-85	35-60	15-35
	39-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
Ch--------------- Chagrin	0-10	Loam-------------	ML, CL, CL-ML	A-4	0	95-100	85-100	80-100	70-90	20-35	2-10
	10-45	Silt loam, loam, sandy loam, sandy clay loam.	ML, SM	A-4, A-2, A-6	0	90-100	75-100	55-90	30-80	20-40	NP-14
	45-60	Stratified silt loam to fine sand.	ML, SM	A-4, A-2	0	85-100	75-100	50-85	15-80	20-40	NP-10
GoB-------------- Glynwood	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	90-100	80-100	55-90	23-40	4-15
	8-34	Clay, clay loam, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	34-60	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	80-100	75-95	65-90	25-40	7-18
HaA-------------- Haskins	0-9	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	85-100	70-100	55-90	25-40	5-20
	9-27	Clay loam, gravelly sandy clay loam, loam.	SC, CL	A-6, A-4, A-2	0	85-100	70-100	55-85	30-65	20-40	7-20
	27-60	Clay, silty clay, clay loam.	CH, CL	A-7, A-6	0	100	85-100	80-100	70-95	35-65	15-40
Ho--------------- Houghton	0-60	Sapric material	PT	A-8	0	---	---	---	---	---	---
McA, McB--------- Martinsville	0-10	Loam-------------	CL-ML, CL	A-4	0	100	90-100	70-100	60-90	20-25	5-9
	10-26	Clay loam, loam	CL	A-6, A-4	0	100	90-100	90-100	70-80	25-40	8-16
	26-41	Sandy loam, sandy clay loam.	SC, SM-SC, CL, CL-ML	A-2, A-4	0	100	90-100	60-90	30-80	20-25	5-9
	41-44	Sandy loam-------	SM-SC, SM, ML, CL-ML	A-2, A-4	0	100	90-100	60-70	30-70	<20	NP-4
	44-65	Gravelly sandy clay loam, sandy clay loam, sandy loam, loam.	SC, SM-SC, SM	A-4, A-2	0	80-100	70-100	60-80	30-50	15-30	3-10
	65-80	Stratified gravelly sandy loam to gravelly sand.	SP, SP-SM	A-1	0	60-80	50-75	15-40	2-10	---	NP
Mh--------------- Milford	0-11	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	75-95	40-60	20-35
	11-43	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	43-60	Stratified clay to sandy loam.	CL, SC	A-6, A-7	0	97-100	95-100	90-100	45-100	25-50	10-30
Mk--------------- Montgomery	0-12	Silty clay-------	CH, CL	A-7	0	100	100	95-100	85-100	45-60	25-35
	12-27	Silty clay loam, silty clay.	CH	A-7	0	100	100	95-100	90-100	50-65	30-42
	27-60	Stratified clay to silty clay loam.	CL, CH	A-7	0	100	100	90-100	85-100	40-55	20-32

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MoC2, MoD2-------- Morley	0-9	Silty clay loam	CL	A-6, A-7	0-5	95-100	90-100	85-95	80-90	30-45	15-25
	9-20	Silty clay, clay loam, clay.	CL, CH	A-7	0-10	95-100	90-100	85-95	80-90	40-60	15-35
	20-29	Silty clay loam, clay loam, silty clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-30
	29-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
Na---------------- Nappanee	0-8	Silt loam---------	ML, CL	A-4, A-6	0-5	95-100	95-100	85-100	55-90	25-40	3-15
	8-25	Silty clay, silty clay loam, clay.	CH	A-7	0-5	95-100	95-100	85-100	70-95	50-70	25-45
	25-60	Silty clay, clay, clay loam.	CL, CH	A-7	0-5	95-100	95-100	85-100	70-95	40-60	20-35
Pm---------------- Pewamo	0-12	Silty clay--------	CH	A-7	0-5	90-100	80-100	80-100	75-95	50-55	25-30
	12-55	Clay loam, clay, silty clay.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	55-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
Px*. Pits											
RdB--------------- Rawson	0-8	Loam--------------	CL-ML, CL	A-4, A-6	0	90-100	80-100	65-100	50-100	25-40	4-16
	8-24	Clay loam, sandy clay loam, sandy loam, gravelly sandy clay loam.	SC, CL	A-4, A-6, A-2-4, A-2-6	0	65-100	55-95	45-90	25-75	20-40	7-20
	24-60	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0	90-100	85-100	85-100	75-95	35-65	15-40
SaB2-------------- St. Clair	0-8	Clay loam---------	CL	A-6, A-7	0-5	95-100	90-100	80-100	60-95	30-45	10-20
	8-36	Clay, silty clay	CH, MH	A-7	0-5	95-100	90-100	75-100	65-95	50-70	20-40
	36-60	Clay, silty clay, silty clay loam.	CH	A-7	0-5	95-100	90-100	70-100	60-95	50-60	25-35
Sc---------------- Saranac	0-12	Clay--------------	CL, CH, ML, MH	A-7	0	100	95-100	90-100	80-95	40-55	15-25
	12-38	Clay, clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	70-90	30-60	10-30
	38-60	Stratified sandy loam to clay loam.	CL, CL-ML, ML	A-4, A-6	0	100	85-100	75-90	65-85	15-40	3-20
Sh---------------- Shoals	0-9	Clay loam---------	CL	A-6	0	100	100	95-100	80-90	30-40	10-15
	9-57	Silt loam, loam, clay loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	5-15
	57-60	Stratified silty clay loam to fine sand.	ML, CL, CL-ML	A-4	0-3	90-100	85-100	60-80	50-70	<30	4-10
Sl---------------- Sloan	0-13	Loam--------------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	13-33	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	33-60	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
Tc---------------- Tice	0-12	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	30-45	10-20
	12-51	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	40-55	15-30
	51-60	Stratified silty clay loam to fine sand.	CL-ML, CL	A-4, A-6, A-7	0	100	100	60-95	55-80	25-45	5-20
Ud*. Udorthents											

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Wh---------------- Whitaker	0-11	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	60-90	15-35	2-15
	11-53	Clay loam, silty clay loam, sandy clay loam, loam.	CL, CL-ML	A-6, A-4	0	100	95-100	90-100	70-80	20-35	5-15
	53-60	Stratified coarse sand to clay.	ML, SM, CL-ML, SM-SC	A-4	0	98-100	98-100	60-85	40-60	<25	NP-7

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cm^3	In/hr	In/in	pH					Pct
Am---------------- Armiesburg	0-20	25-35	1.30-1.45	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	6	2-4
	20-60	30-35	1.30-1.45	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.28			
BcA, BcB--------- Blount	0-9	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	6	2-3
	9-39	35-50	1.40-1.70	0.06-0.2	0.12-0.19	4.5-6.5	Moderate-----	0.43			
	39-60	27-38	1.60-1.85	0.06-0.2	0.07-0.10	7.4-8.4	Moderate-----	0.43			
Ch---------------- Chagrin	0-10	10-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.32	5	5	2-4
	10-45	18-30	1.20-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low-----------	0.32			
	45-60	5-25	1.20-1.40	0.6-2.0	0.08-0.20	5.6-7.3	Low-----------	0.32			
GoB--------------- Glynwood	0-8	16-27	1.25-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.43	3	6	1-3
	8-34	35-55	1.45-1.75	0.06-0.2	0.11-0.18	4.5-7.8	Moderate-----	0.32			
	34-60	27-36	1.65-1.85	0.06-0.2	0.06-0.10	7.4-8.4	Moderate-----	0.32			
HaA--------------- Haskins	0-9	12-20	1.30-1.45	0.6-2.0	0.18-0.22	5.1-7.3	Low-----------	0.37	4	5	1-4
	9-27	18-35	1.45-1.70	0.6-2.0	0.12-0.16	4.5-7.3	Low-----------	0.37			
	27-60	27-40	1.60-1.80	0.06-0.2	0.08-0.12	6.1-8.4	Moderate-----	0.37			
Ho---------------- Houghton	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8	--------------	----	2	2	>70
McA, McB--------- Martinsville	0-10	14-18	1.40-1.55	0.6-2.0	0.15-0.18	5.6-6.5	Low-----------	0.24	5	3	1-2
	10-26	22-33	1.50-1.60	0.6-2.0	0.14-0.19	4.5-5.5	Moderate-----	0.32			
	26-41	14-18	1.40-1.60	0.6-2.0	0.12-0.15	4.5-5.5	Low-----------	0.24			
	41-44	8-12	1.60-1.75	6.0-20	0.09-0.11	4.5-6.5	Low-----------	0.17			
	44-65	10-25	1.45-1.65	0.6-2.0	0.13-0.15	5.6-7.3	Low-----------	0.28			
	65-80	0-7	1.70-1.90	6.0-20	0.02-0.04	7.4-8.4	Low-----------	0.10			
Mh---------------- Milford	0-11	35-42	1.30-1.50	0.6-2.0	0.12-0.23	5.6-7.3	High----------	0.28	5	4	5-6
	11-43	35-42	1.40-1.65	0.2-0.6	0.18-0.20	5.6-7.8	Moderate-----	0.43			
	43-60	20-30	1.50-1.70	0.2-0.6	0.20-0.22	6.6-8.4	Moderate-----	0.43			
Mk---------------- Montgomery	0-12	40-48	1.40-1.60	0.2-0.6	0.12-0.14	6.1-7.8	High----------	0.37	5	4	3-6
	12-27	40-55	1.45-1.65	0.06-0.2	0.11-0.18	6.1-7.8	High----------	0.37			
	27-60	35-48	1.50-1.70	0.06-0.2	0.18-0.20	7.4-8.4	Moderate-----	0.37			
MoC2, MoD2-------- Morley	0-9	27-35	1.40-1.60	0.2-0.6	0.18-0.22	5.1-6.5	Moderate-----	0.43	2	7	1-3
	9-20	35-50	1.55-1.70	0.2-0.6	0.11-0.15	6.1-7.8	Moderate-----	0.43			
	20-29	27-50	1.60-1.80	0.06-0.2	0.07-0.12	6.1-8.4	Moderate-----	0.43			
	29-60	27-40	1.60-1.80	0.06-0.2	0.07-0.12	6.1-8.4	Moderate-----	0.43			
Na---------------- Nappanee	0-8	20-27	1.30-1.50	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	6	1-3
	8-25	45-60	1.40-1.80	0.06-0.2	0.08-0.14	5.1-7.8	Moderate-----	0.32			
	25-60	35-50	1.60-1.85	0.06-0.2	0.06-0.12	7.4-8.4	Moderate-----	0.32			
Pm---------------- Pewamo	0-12	40-45	1.35-1.55	0.2-0.6	0.12-0.20	6.1-7.3	Moderate-----	0.24	5	4	3-5
	12-55	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate-----	0.24			
	55-60	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate-----	0.24			
Px*. Pits											
RdB--------------- Rawson	0-8	12-20	1.35-1.50	0.6-2.0	0.18-0.22	4.5-7.3	Low-----------	0.32	4-3	5	1-3
	8-24	18-35	1.50-1.70	0.6-2.0	0.12-0.16	5.1-7.8	Low-----------	0.32			
	24-60	35-55	1.60-1.85	0.06-0.2	0.08-0.12	6.6-8.4	Moderate-----	0.32			
SaB2-------------- St. Clair	0-8	27-40	1.50-1.60	0.2-2.0	0.17-0.23	5.6-7.3	Moderate-----	0.37	2	7	1-3
	8-36	35-55	1.35-1.70	0.06-0.2	0.10-0.12	4.5-7.3	High----------	0.37			
	36-60	35-55	1.60-1.75	0.06-0.2	0.09-0.11	7.4-8.4	High----------	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cm3	In/hr	In/in	pH					Pct
Sc---------------- Saranac	0-12	40-50	0.90-1.50	0.2-0.6	0.12-0.20	6.1-7.3	Moderate-----	0.24	5	4	4-6
	12-38	27-60	1.30-1.80	0.2-0.6	0.10-0.20	6.1-7.3	Moderate-----	0.24			
	38-60	10-35	1.40-1.95	0.2-0.6	0.10-0.20	6.1-7.3	Low----------	0.24			
Sh---------------- Shoals	0-9	27-32	1.35-1.55	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.37	5	7	2-5
	9-57	18-33	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.8	Low----------	0.37			
	57-60	12-25	1.35-1.60	0.6-2.0	0.12-0.21	6.6-8.4	Low----------	0.37			
Sl---------------- Sloan	0-13	15-27	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	6	3-6
	13-33	22-35	1.25-1.55	0.6-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.37			
	33-60	10-30	1.20-1.50	0.6-2.0	0.13-0.18	6.6-8.4	Low----------	0.37			
Tc---------------- Tice	0-12	22-35	1.25-1.45	0.6-2.0	0.21-0.24	6.1-7.8	Moderate-----	0.32	5	7	2-3
	12-51	27-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.32			
	51-60	15-30	1.40-1.60	0.6-2.0	0.11-0.18	6.1-7.8	Moderate-----	0.32			
Ud*. Udorthents											
Wh---------------- Whitaker	0-11	8-19	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	11-53	18-30	1.40-1.60	0.6-2.0	0.15-0.19	5.1-6.0	Moderate-----	0.37			
	53-60	3-18	1.50-1.70	0.6-6.0	0.19-0.21	6.1-8.4	Low----------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "frequent," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Am: Armiesburg	B	Frequent	Brief	Oct-Jun	>6.0	---	---	>60	---	High	Moderate	Low.
BcA, BcB: Blount	C	None	---	---	1.0-3.0	Perched	Jan-May	>60	---	High	High	High.
Ch: Chagrin	B	Frequent	Brief	Nov-May	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderate	Low	Moderate.
GoB: Glynwood	C	None	---	---	2.0-3.5	Perched	Jan-Apr	>60	---	High	High	Moderate.
HaA: Haskins	C	None	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High	High	Moderate.
Ho: Houghton	A/D	None	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High	High	Low.
McA, McB: Martinsville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Mh: Milford	B/D	None	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High	High	Low.
Mk: Montgomery	D	None	---	---	+1-1.0	Apparent	Dec-May	>60	---	Moderate	High	Low.
MoC2, MoD2: Morley	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Na: Nappanee	D	None	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High	Low.
Pm: Pewamo	C/D	None	---	---	+1-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Px*. Pits												
RdB: Rawson	B	None	---	---	2.5-4.0	Perched	Jan-Apr	>60	---	Moderate	High	High.
SaB2: St. Clair	D	None	---	---	2.0-3.0	Perched	Mar-May	>60	---	Moderate	High	Moderate.
Sc: Saranac	C/D	Frequent	Very long	Jan-Dec	0-1.0	Apparent	Sep-Jun	>60	---	High	High	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Sh----------------- Shoals	C	Frequent----	Brief-----	Oct-Jun	0.5-1.5	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
Sl----------------- Sloan	B/D	Frequent----	Brief-----	Nov-Jun	0-1.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
Tc----------------- Tice	B	Frequent----	Brief-----	Jan-Jun	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
Ud*. Udorthents												
Wh----------------- Whitaker	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Armiesburg	Fine-silty, mixed, mesic Fluventic Hapludolls
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Glynwood	Fine, illitic, mesic Aquic Hapludalfs
*Haskins	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Houghton	Euic, mesic Typic Medisaprists
*Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Milford	Fine, mixed, mesic Typic Haplaquolls
Montgomery	Fine, mixed, mesic Typic Haplaquolls
Morley	Fine, illitic, mesic Typic Hapludalfs
Nappanee	Fine, illitic, mesic Aeric Ochraqualfs
*Pewamo	Fine, mixed, mesic Typic Argiaquolls
Rawson	Fine-loamy, mixed, mesic Typic Hapludalfs
*St. Clair	Fine, illitic, mesic Typic Hapludalfs
Saranac	Fine, mixed, mesic Fluvaquentic Haplaquolls
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Tice	Fine-silty, mixed, mesic Fluvaquentic Hapludolls
Udorthents	Loamy, mixed, mesic Udorthents
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs

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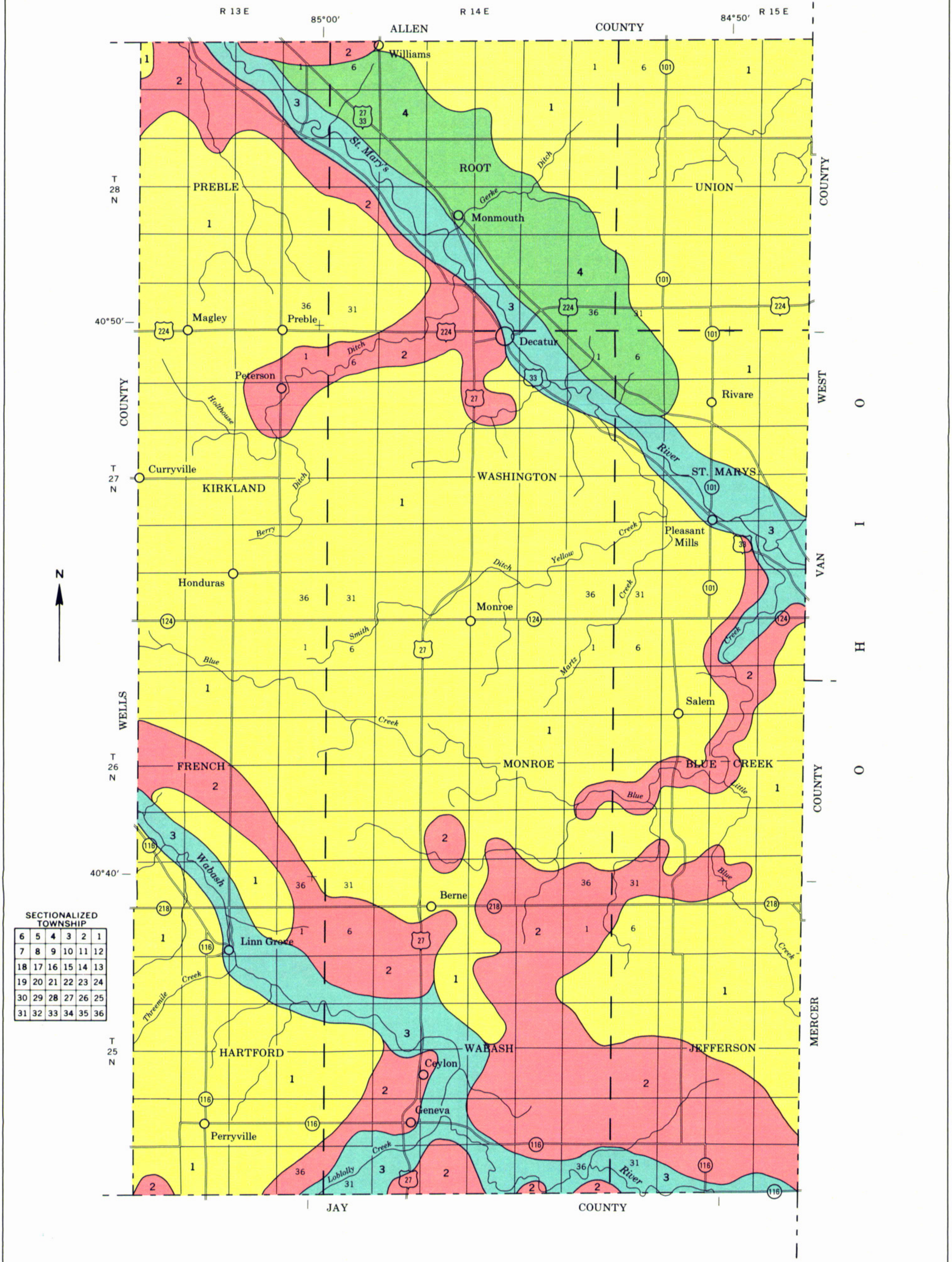


LEGEND*

1	BLOUNT-PEWAMO: Deep, nearly level, somewhat poorly drained and very poorly drained, silty and clayey soils on till plains and moraines
2	GLYNWOOD-BLOUNT: Deep, nearly level and gently sloping, moderately well drained and somewhat poorly drained, silty soils on till plains
3	SARANAC-TICE-SLOAN: Deep, nearly level, very poorly drained and somewhat poorly drained, clayey, silty, and loamy soils on bottom lands
4	NAPPANEE-ST. CLAIR: Deep, nearly level and gently sloping, somewhat poorly drained and moderately well drained, silty and loamy soils on till plains and moraines

*Texture terms in the descriptive headings refer to the surface layer of the major soils in the associations.

Compiled 1984

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION
INDIANA DEPARTMENT OF NATURAL RESOURCES
SOIL AND WATER CONSERVATION COMMITTEE

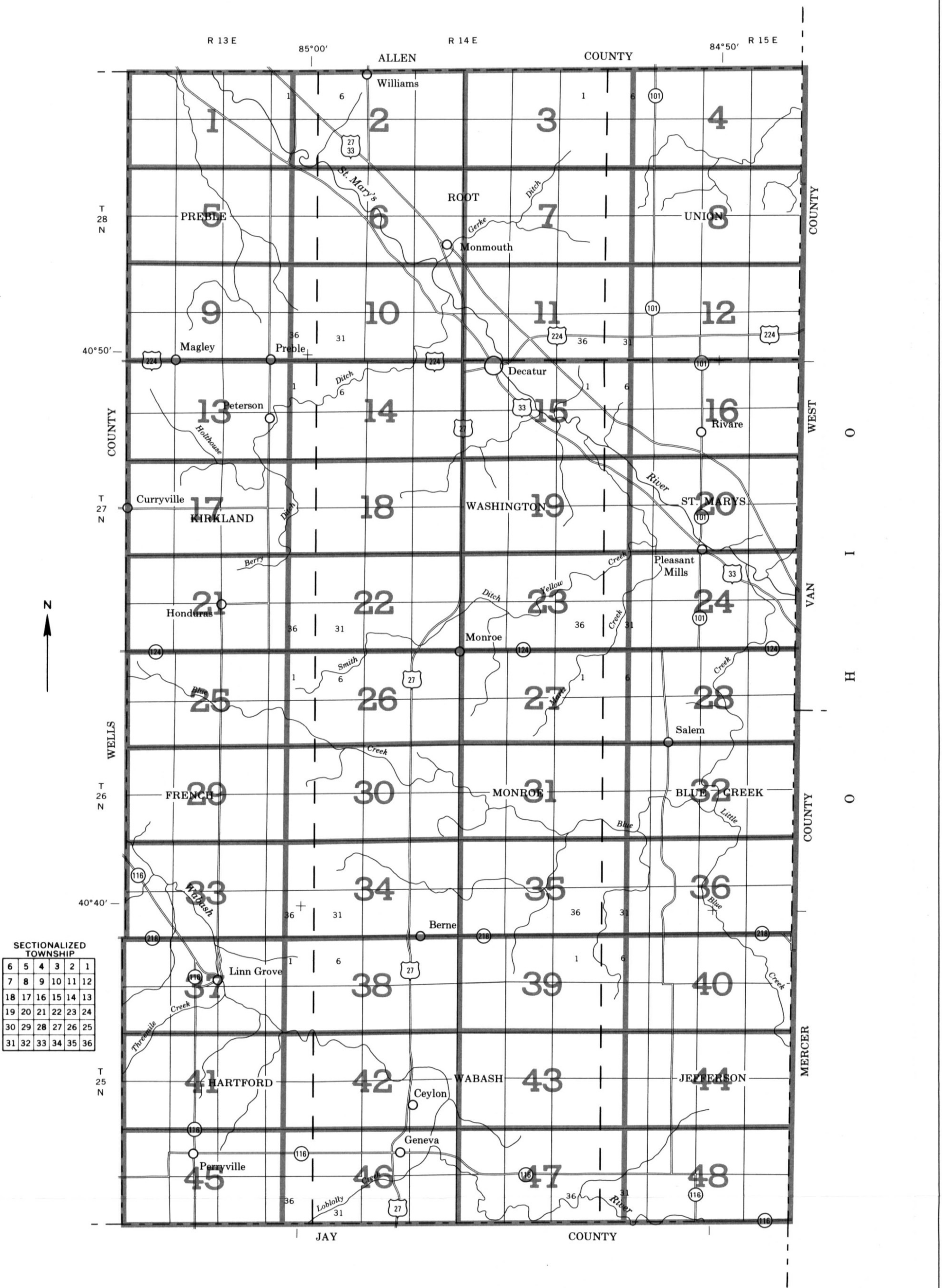
GENERAL SOIL MAP

ADAMS COUNTY
INDIANA

Scale 1:126,720

1 0 1 2 3 4 Miles

1 0 3 6 Km



Original text from each individual map sheet read:
This map is compiled on 1977 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

INDEX TO MAP SHEETS
ADAMS COUNTY
INDIANA

Scale 1:126,720

1 0 1 2 3 4 Miles

1 0 3 6 Km

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and numbers. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is moderately eroded.

NAME	SYMBOL
Am	Armiesburg silty clay loam, frequently flooded
BcA	Blount silt loam, 0 to 1 percent slopes
BcB	Blount silt loam, 1 to 4 percent slopes
Ch	Chagrin loam, frequently flooded
GoB	Glynwood silt loam, 3 to 8 percent slopes
HaA	Haskins loam, 1 to 3 percent slopes
Ho	Houghton muck, drained
McA	Martinsville loam, 0 to 2 percent slopes
McB	Martinsville loam, 2 to 6 percent slopes
Mh	Milford silty clay loam
Mk	Montgomery silt clay
MoC2	Morley silty clay loam, 6 to 12 percent slopes, eroded
MoD2	Morley silty clay loam, 12 to 18 percent slopes, eroded
Na	Nappanee silt loam, 0 to 3 percent slopes
Pm	Pewamo silty clay
Px	Pits
RdB	Rawson loam, 2 to 6 percent slopes
SaB2	St. Clair clay loam, 3 to 8 percent slopes, eroded
Sc	Saranac clay, frequently flooded
Sh	Shoals clay loam, frequently flooded
Sl	Sloan loam, frequently flooded
Tc	Tice silty clay loam, frequently flooded
Ud	Udorthents, loamy
Wh	Whitaker silt loam

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) — Hedley Airstrip

- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water, w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — Na, MoC2

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

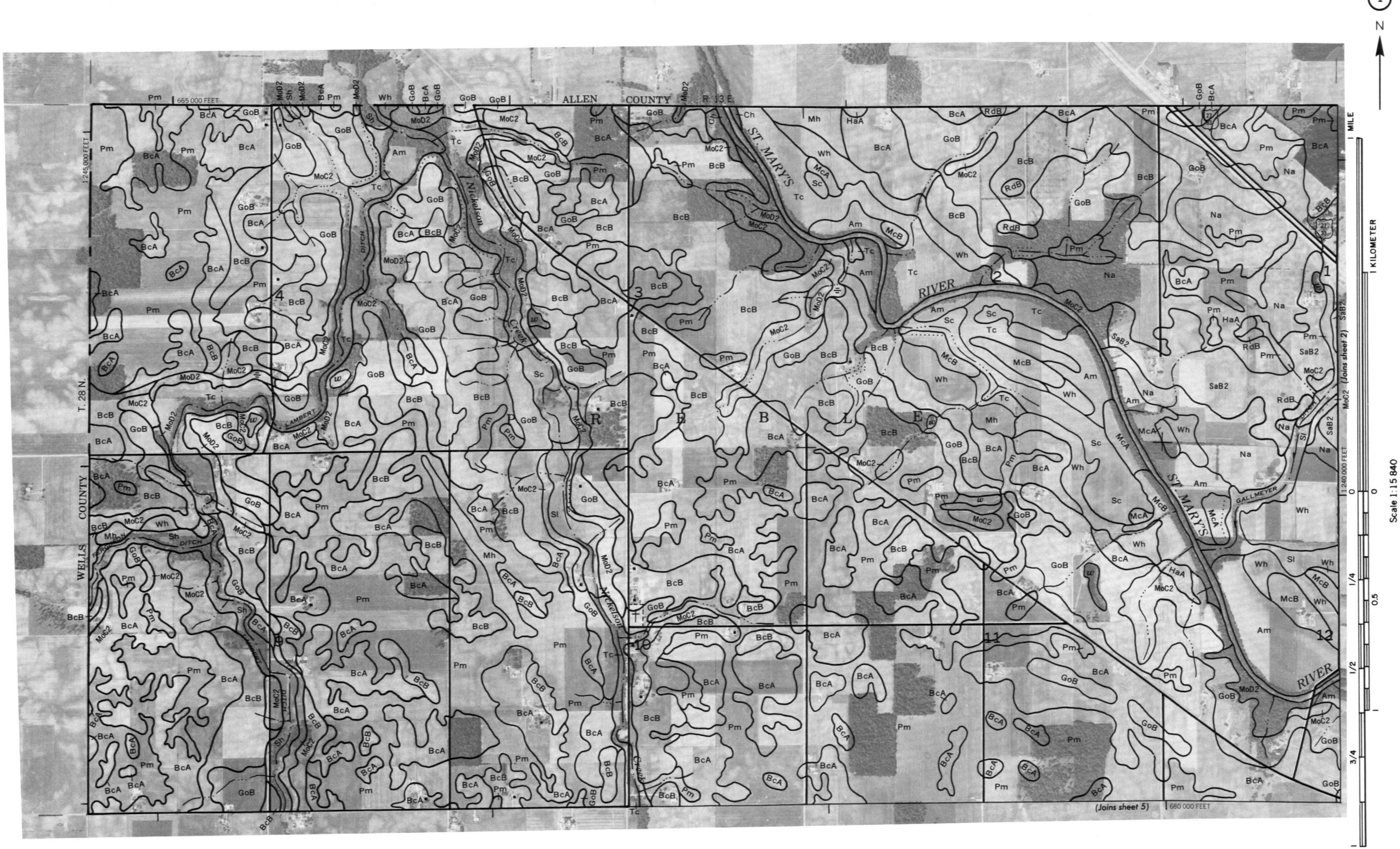
DEPRESSION OR SINK

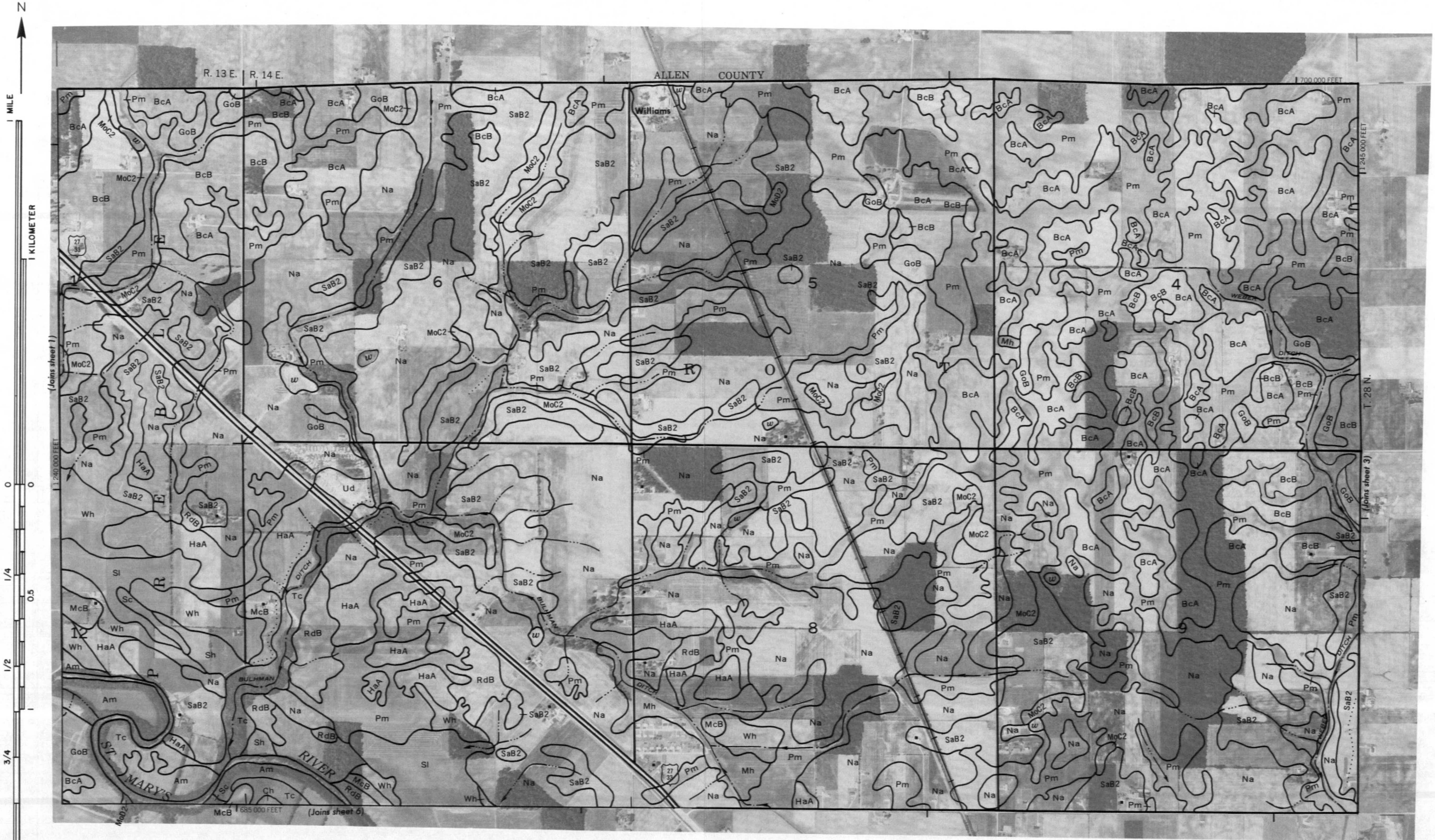
SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

ADAMS COUNTY, INDIANA — SHEET NUMBER 1

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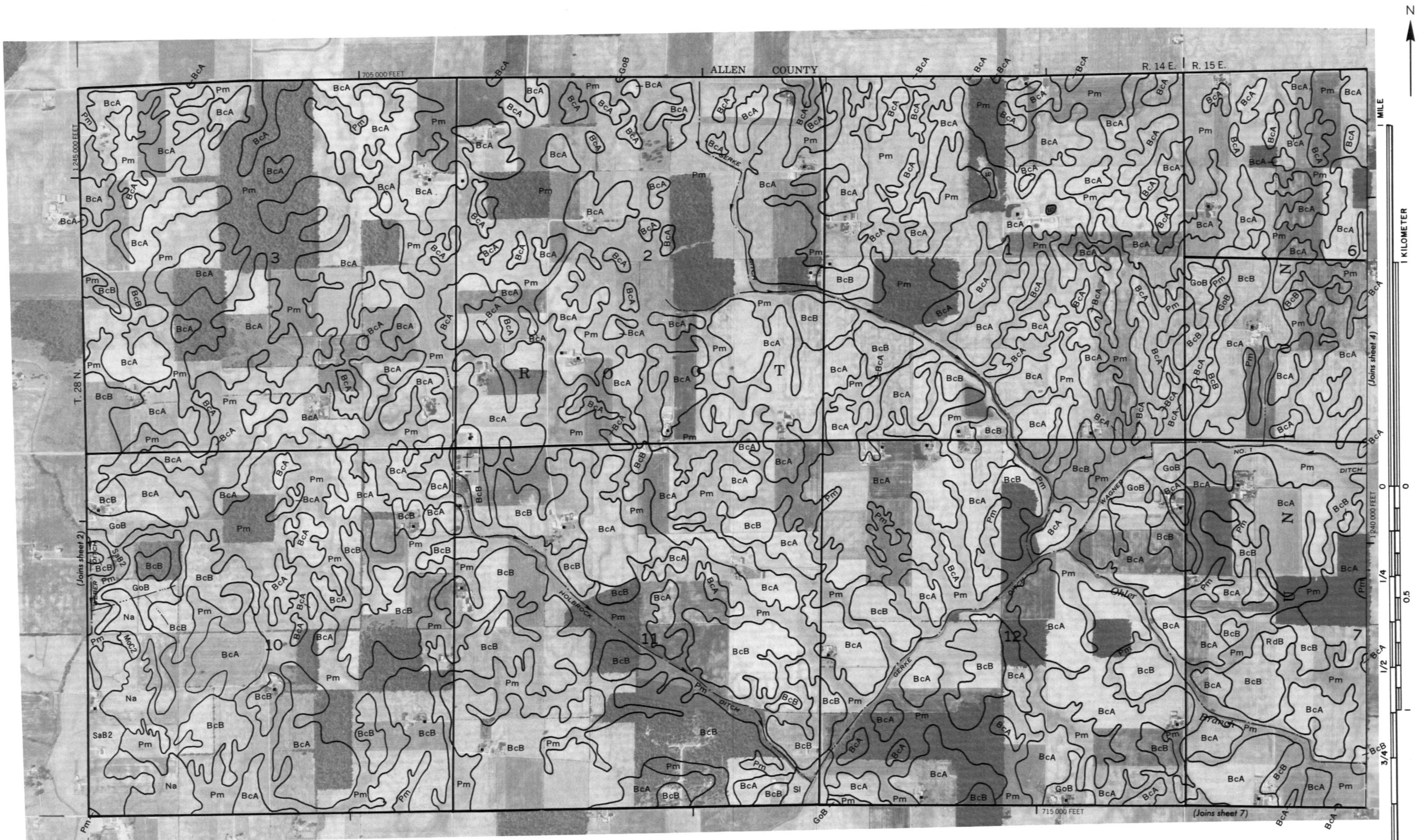
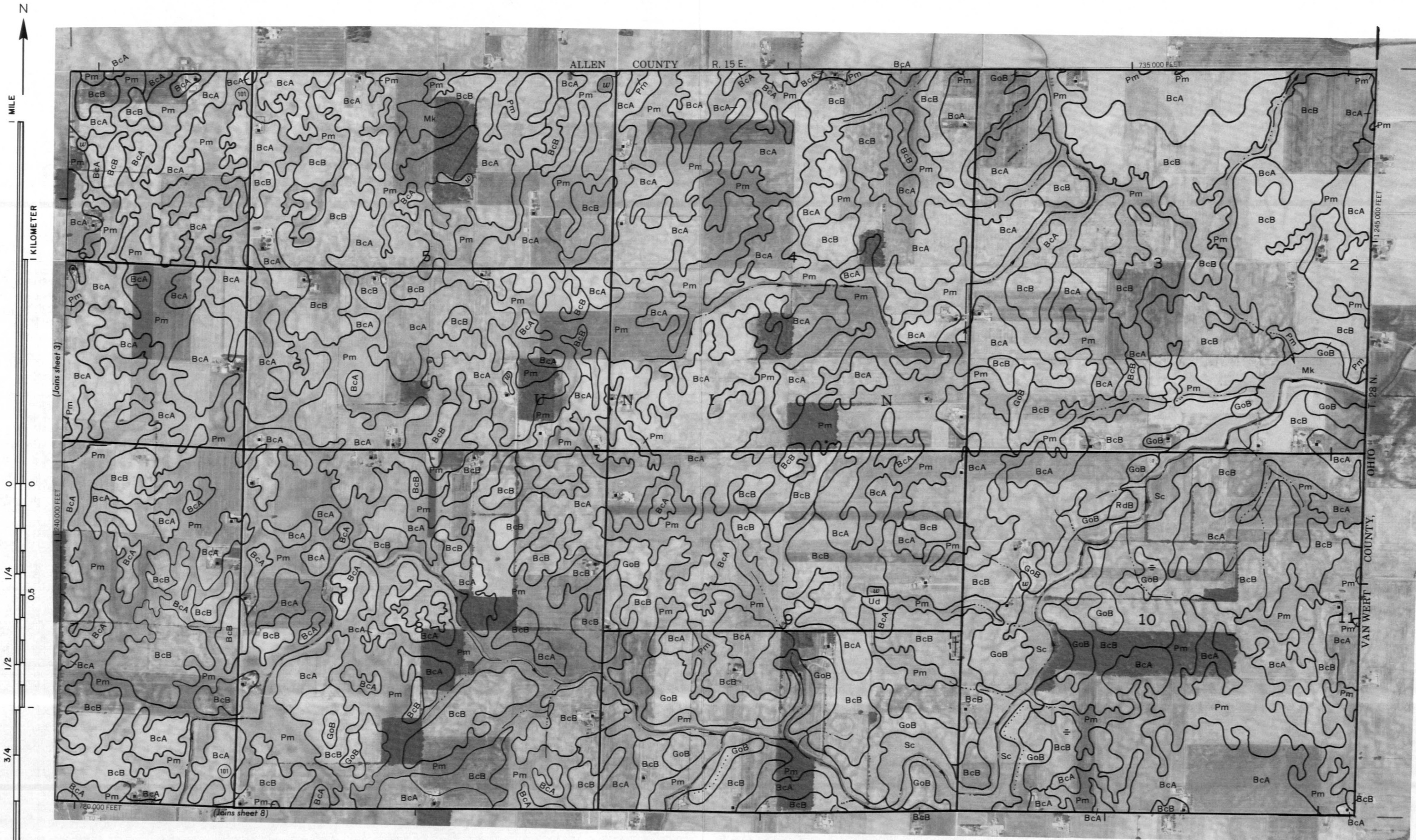
MILE
KILOMETER
R. 13 E.
R. 14 E.
ALLEN COUNTY
Williams
T. 28 N.
700 000 FEET
1 245 000 FEET
1 240 000 FEET
685 000 FEET
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 6)
ST. MARY'S RIVER
BULHMAN DITCH
WEBER DITCH
ROOT
PREBLE

ADAMS COUNTY, INDIANA — SHEET NUMBER 3

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MILE
KILOMETER
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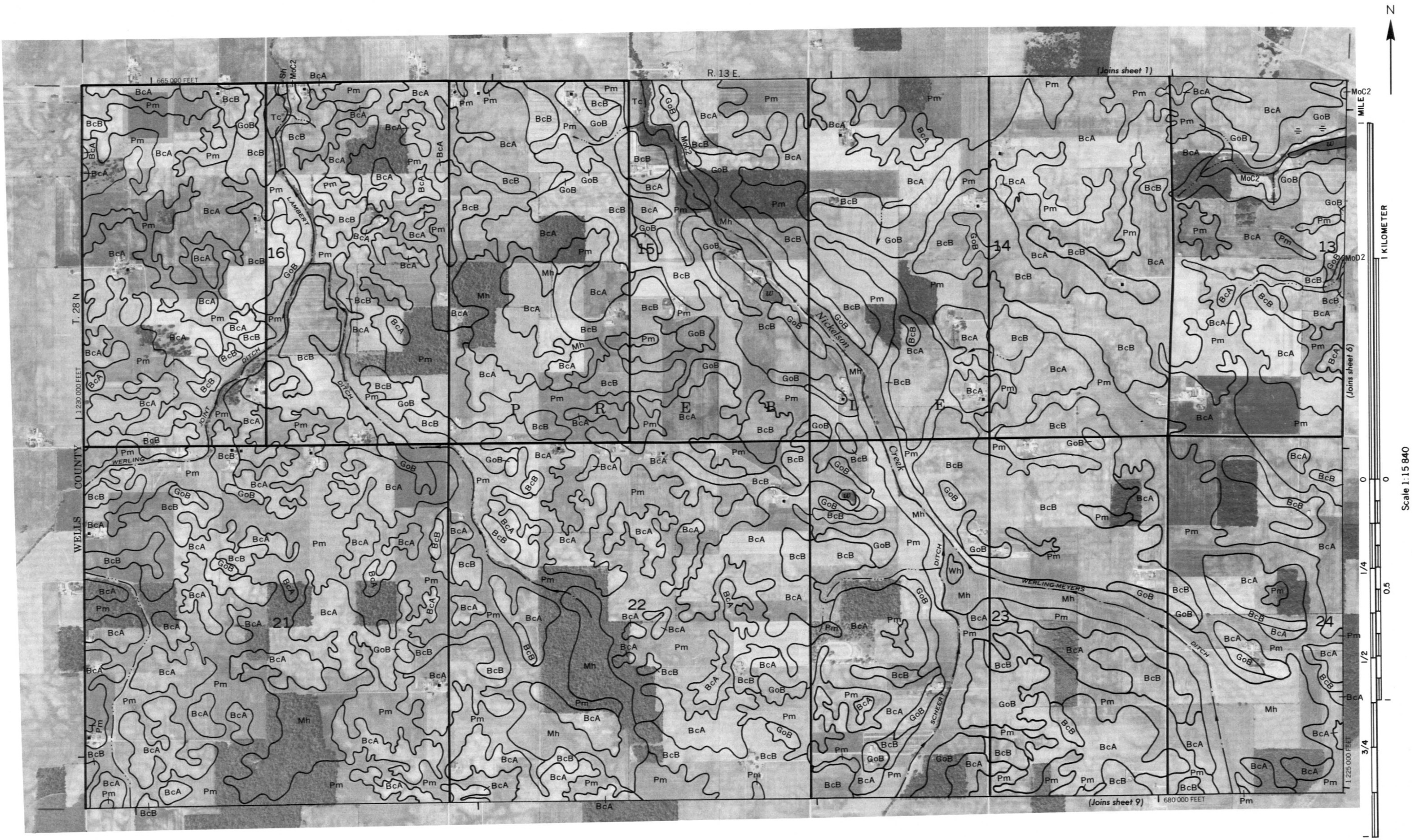
1/4
1/2
3/4
0.5
ALLEN COUNTY
R. 15 E.
735 000 FEET
1 245 000 FEET
1 240 000 FEET
780 000 FEET
(Joins sheet 3)
(Joins sheet 8)
U N I O N
T. 28 N.
OHIO
VAN WERT COUNTY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N
R. 13 E.
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(Joins sheet 6)
(Joins sheet 9)
T. 28 N.
WELLS COUNTY
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680 000 FEET
1 230 000 FEET
1 225 000 FEET
16
15
14
13
21
22
23
24
P R E B L E
Nickelson Creek
LAMBERT DITCH
JOINT DITCH
WERLING
WERLING-MEYERS
DITCH
SCHEER
MILE
KILOMETER
0
1/4
0.5
1/2
3/4
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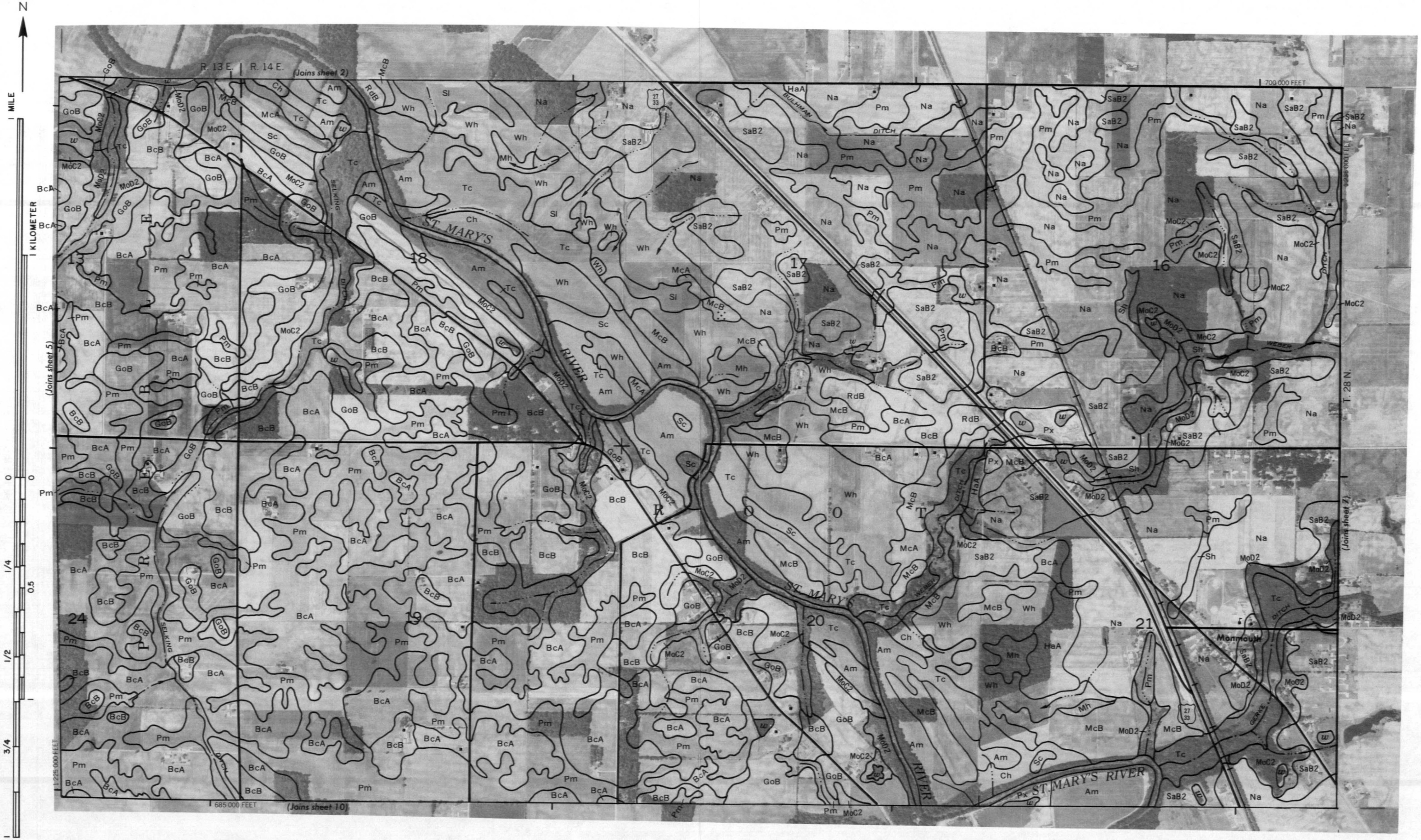
BcB
Pm
GoB
Mh
MoC2
MoD2
Tc
Sh
Wh
w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1 KILOMETER
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1/4
1/2
3/4
0.5
R. 13 E.
R. 14 E.
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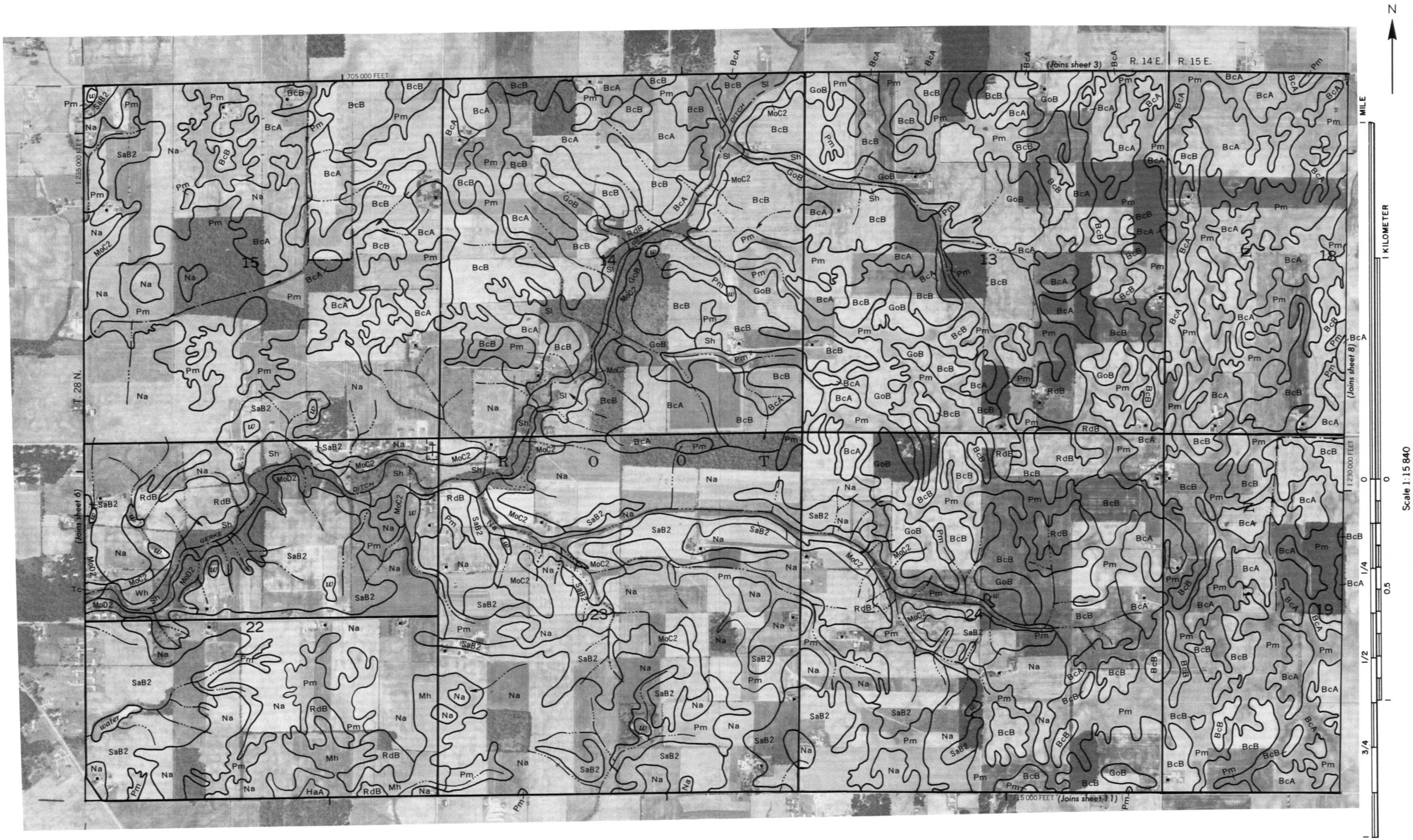
(Joins sheet 5)
(Joins sheet 7)
(Joins sheet 10)
T. 28 N.
700 000 FEET
685 000 FEET
ST. MARY'S RIVER
ST. MARY'S
BULHMAN DITCH
SELKING DITCH
WEBER DITCH
Monmouth
ROOT
13
16
17
18
19
20
21
24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R. 15 E.
705 000 FEET
1 235 000 FEET
T. 28 N.
(Joins sheet 6)
(Joins sheet 8)
715 000 FEET
(Joins sheet 11)
1 230 000 FEET
R O O T
DITCH
GERKE
water
15
14
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23
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1 KILOMETER
Scale 1:15 840
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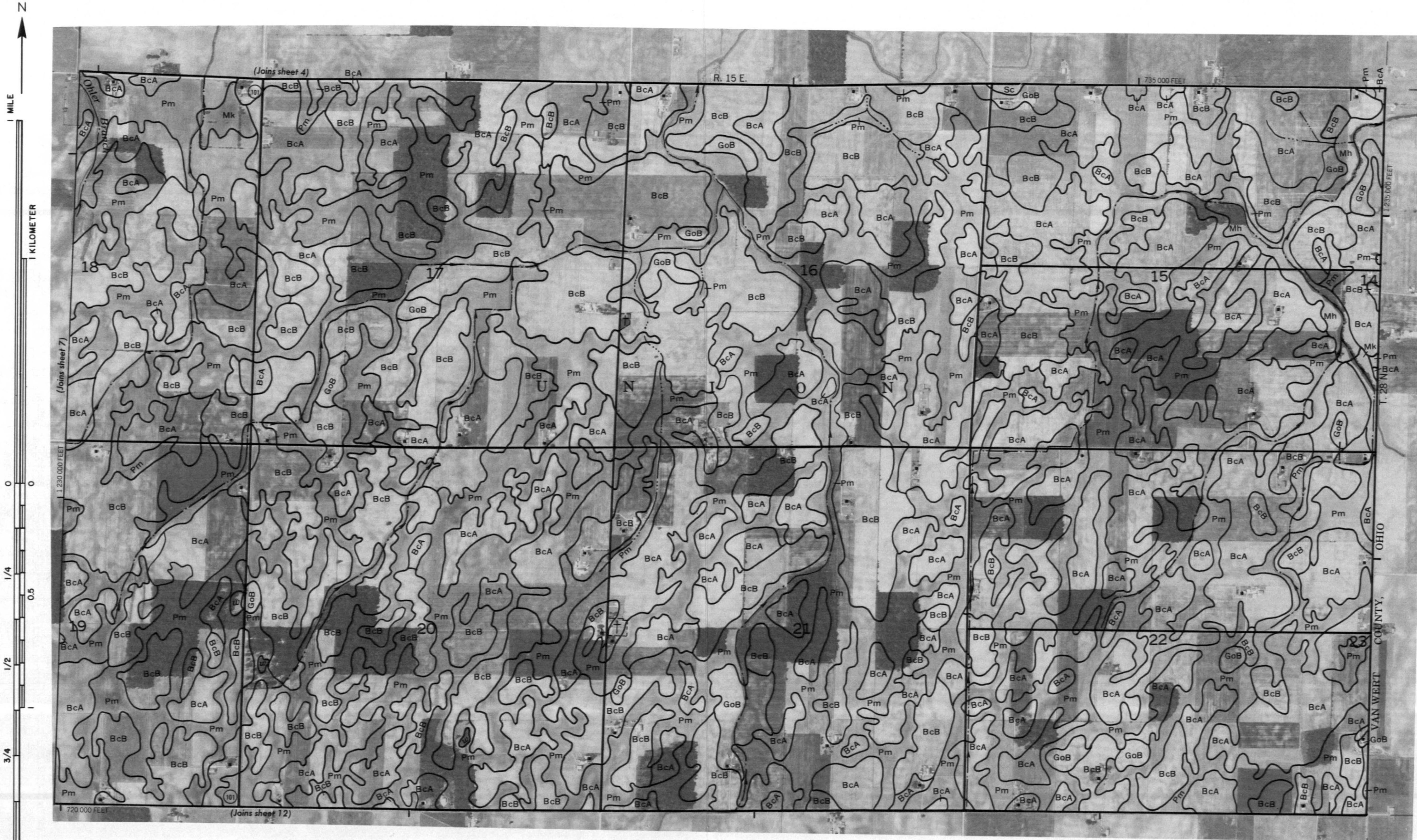
1/4
0.5
1/2
3/4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1 KILOMETER
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1/2
3/4
0
0.5
1
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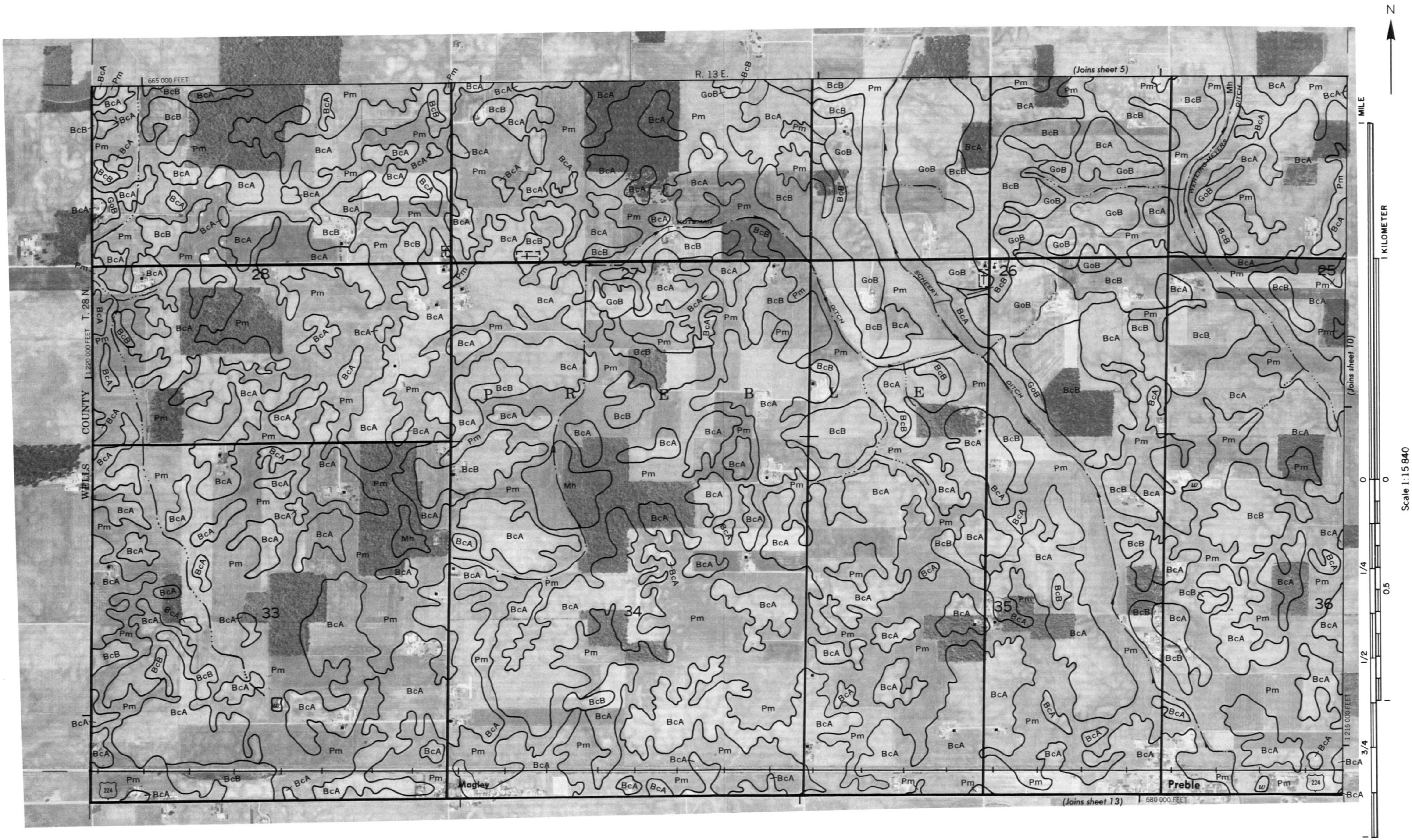
735 000 FEET
1 235 000 FEET
T. 28 N.
(Joins sheet 7)
1 230 000 FEET
720 000 FEET
(Joins sheet 12)
Ohler Branch
U N I O N
18
17
16
15
14
19
20
21
22
23
VAN WERT COUNTY, OHIO
101
BcA
BcB
Pm
GoB
Mk
Mh
Sc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T. 28 N.
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WELLS COUNTY
P R E B L E
28
27
26
25
33
34
35
36
SCHEERY DITCH
DITCH
Magley
Preble
224
(Joins sheet 10)
(Joins sheet 13)
680 000 FEET
1 215 000 FEET
BcA
BcB
Pm
GoB
Mh
w
MILE
KILOMETER
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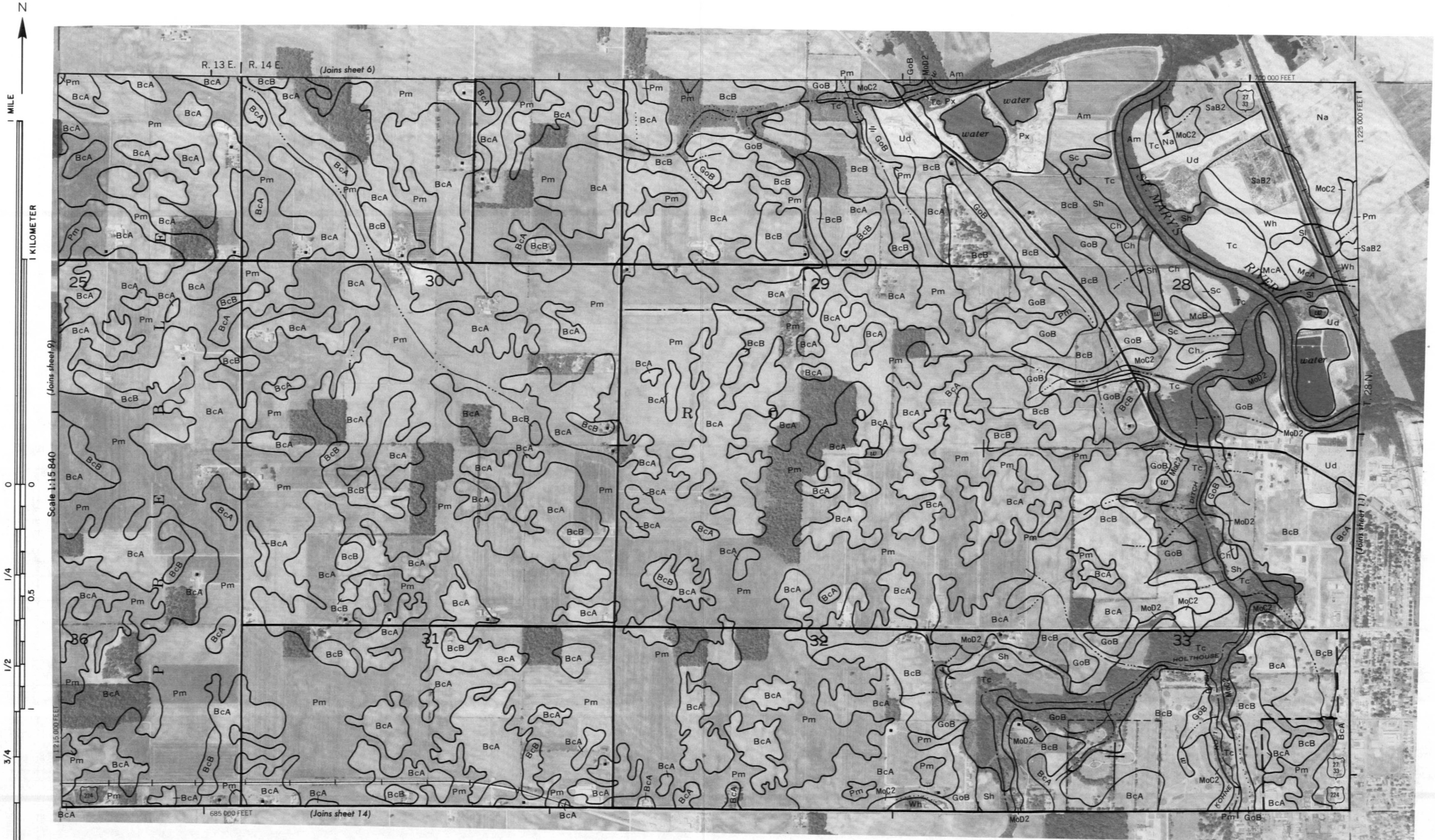
1/4
1/2
3/4
0.5
1
Scale 1:15 840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1 KILOMETER
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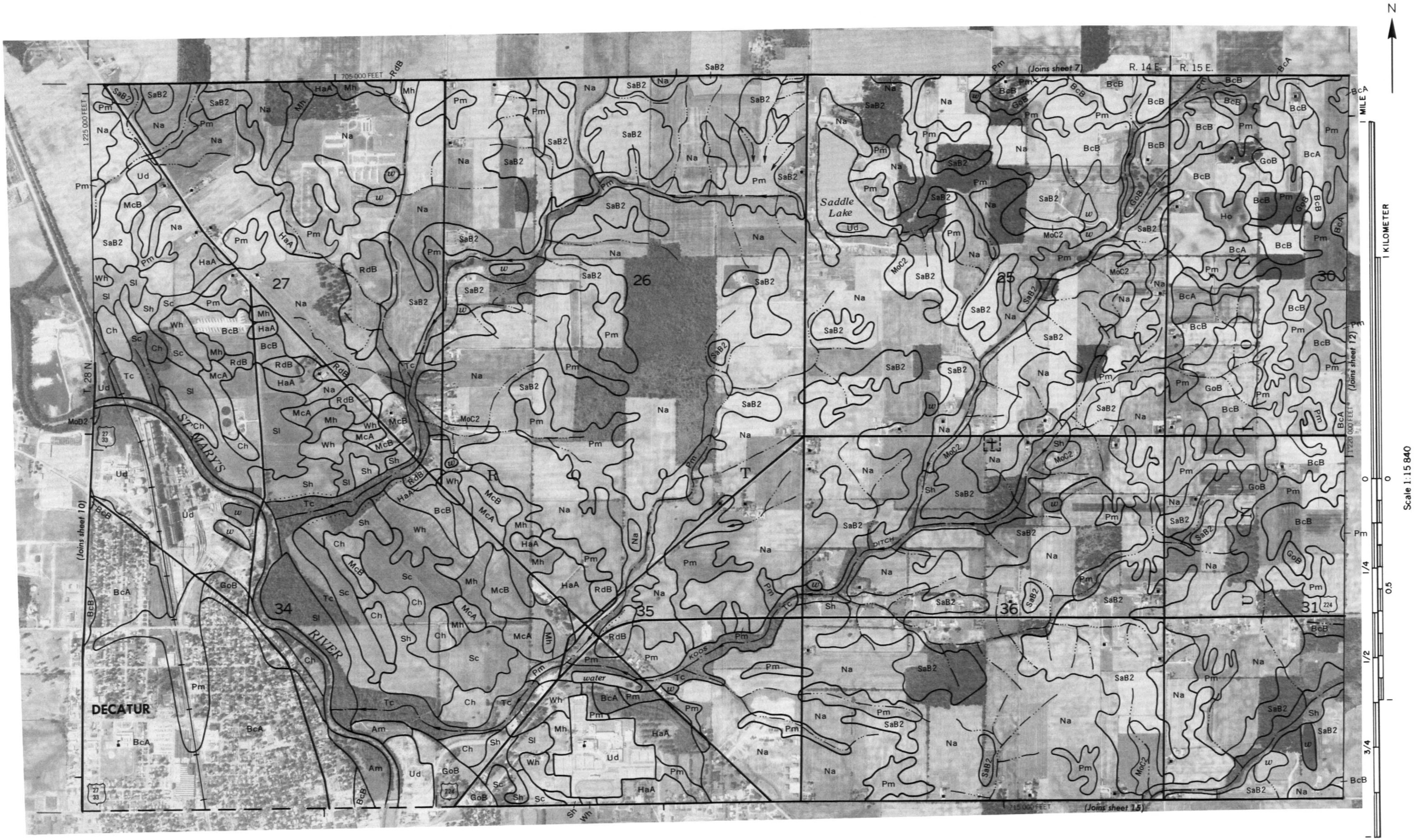
1/4
0.5
1/2
1
3/4
1
Scale 1:15 840
R. 13 E.
R. 14 E.
(Joins sheet 6)
(Joins sheet 9)
(Joins sheet 11)
(Joins sheet 14)
685 000 FEET
700 000 FEET
1 225 000 FEET
1 215 000 FEET
T. 28 N.
25
30
29
28
36
31
32
33
ROOT
PREBLE
ST. MARYS RIVER
DITCH
HOLTHOUSE
KOHNE
water
27
33
224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(Joins sheet 7)
R. 14 E.
R. 15 E.
705 000 FEET
1 225 000 FEET
T. 28 N.
(Joins sheet 10)
(Joins sheet 12)
1 220 000 FEET
715 000 FEET
(Joins sheet 15)
Saddle Lake
DECATUR
ST. MARY'S
RIVER
KOOS
DITCH
R
O
O
T
U
N
I
O
N
25
26
27
30
31
34
35
36
water
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
Na
Pm
SaB2
BcB
BcA
GoB
MoC2
Ud
Sh
Wh
Ch
Sc
Sl
Tc
Mh
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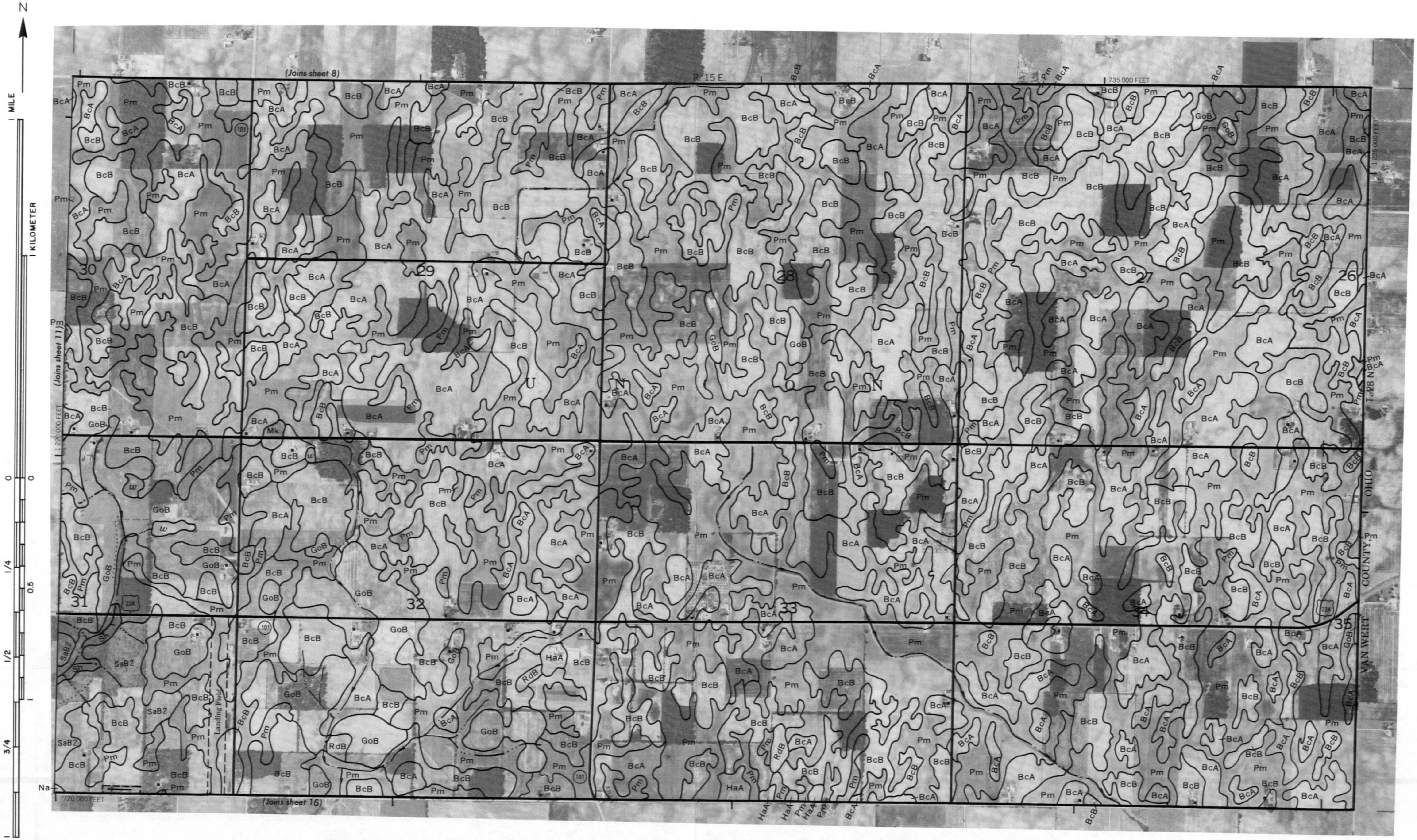
McB
HaA
RdB
Am
Ho
MoD2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MILE
KILOMETER
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1/4
1/2
3/4
0
0.5
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R. 15 E.
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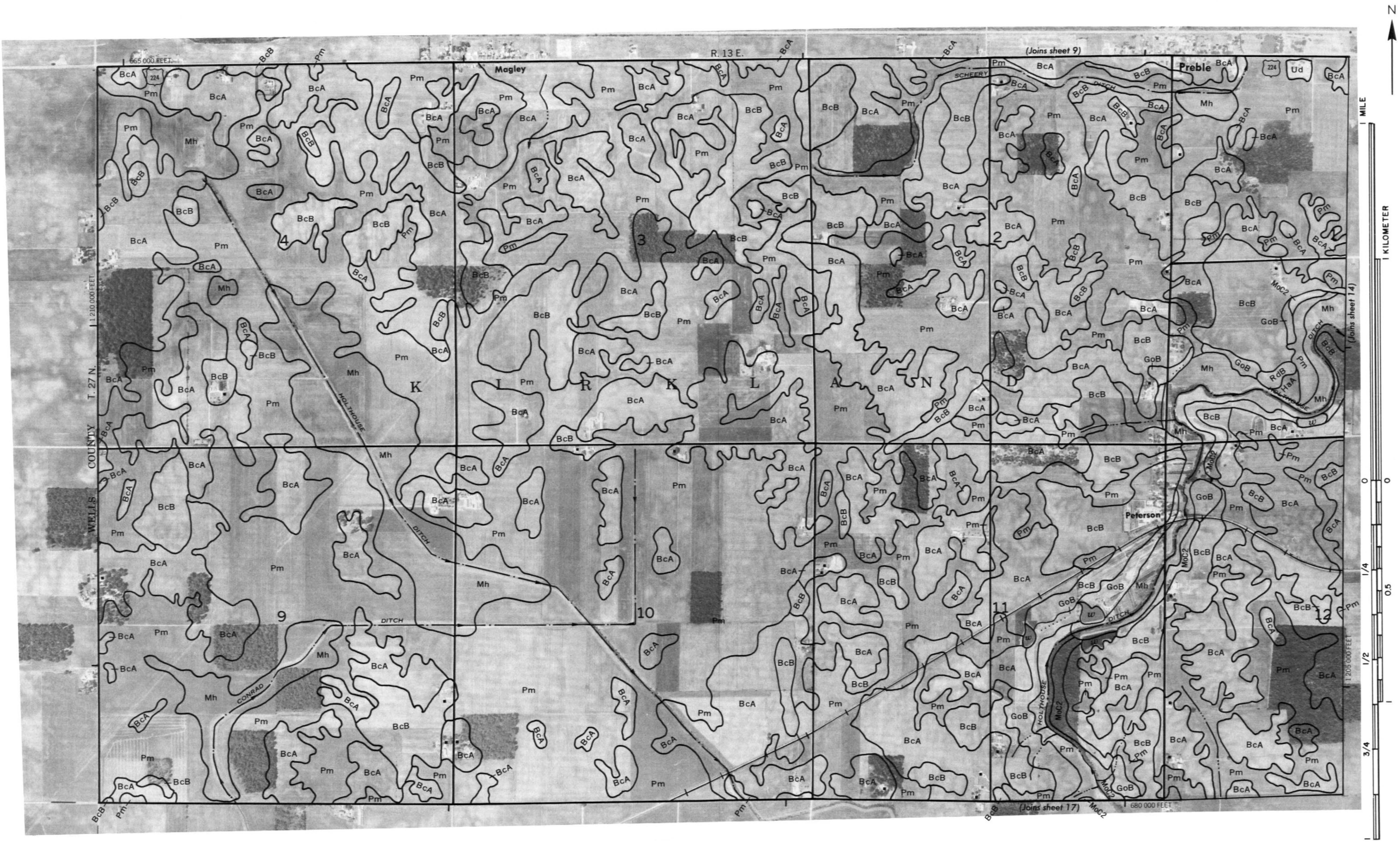
(Joins sheet 11)
220 000 FEET
225 000 FEET
T. 28 N.
720 000 FEET
(Joins sheet 16)
Landing Field
OHIO
VAN WERT COUNTY
26
27
28
29
30
31
32
33
34
35
101
224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(Joins sheet 9)
R. 13 E.
665 000 FEET
Magley
Preble
SCHEERY DITCH
(Joins sheet 14)
1 210 000 FEET
T. 27 N.
WELLS COUNTY
K I R K L A N D
HOLTHOUSE DITCH
CONRAD DITCH
Peterson
4
3
2
9
10
11
12
(Joins sheet 17)
680 000 FEET
1 205 000 FEET
1 MILE
1 KILOMETER
Scale 1:15 840
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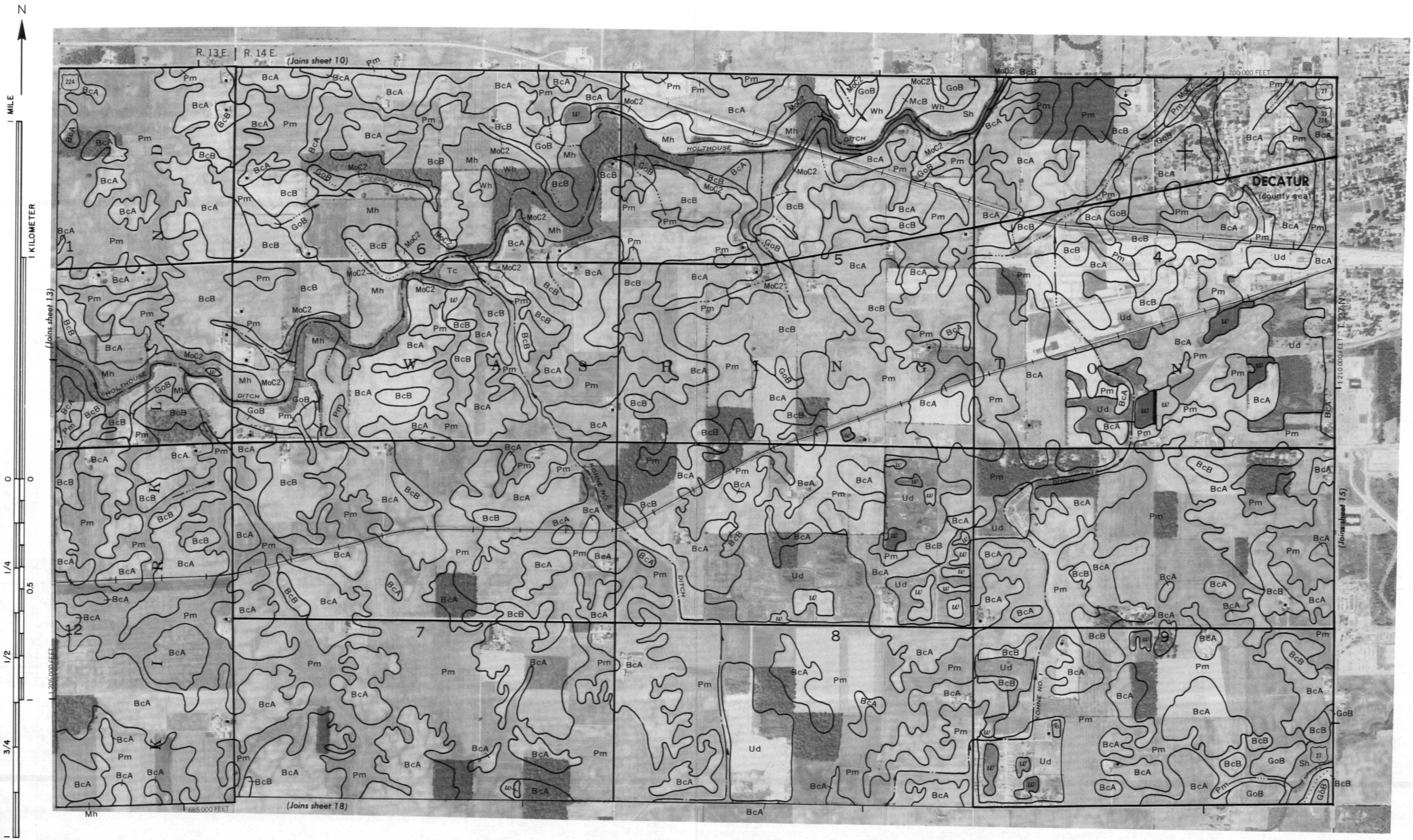
1/4
1/2
3/4
0.5


N
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0
0.5
R. 13 E.
R. 14 E.
(Joins sheet 10)
(Joins sheet 13)
(Joins sheet 15)
(Joins sheet 18)
DECATUR
(county seat)
HOLTHOUSE
DITCH
YOHNE NO. 2
YOHNE NO. 1
700 000 FEET
685 000 FEET
1 210 000 FEET
1 205 000 FEET
T. 27 N.
KIRKLAND
WASHINGTON
1
4
5
6
7
8
9
12
224
27
33
BcA
BcB
Pm
Mh
MoC2
GoB
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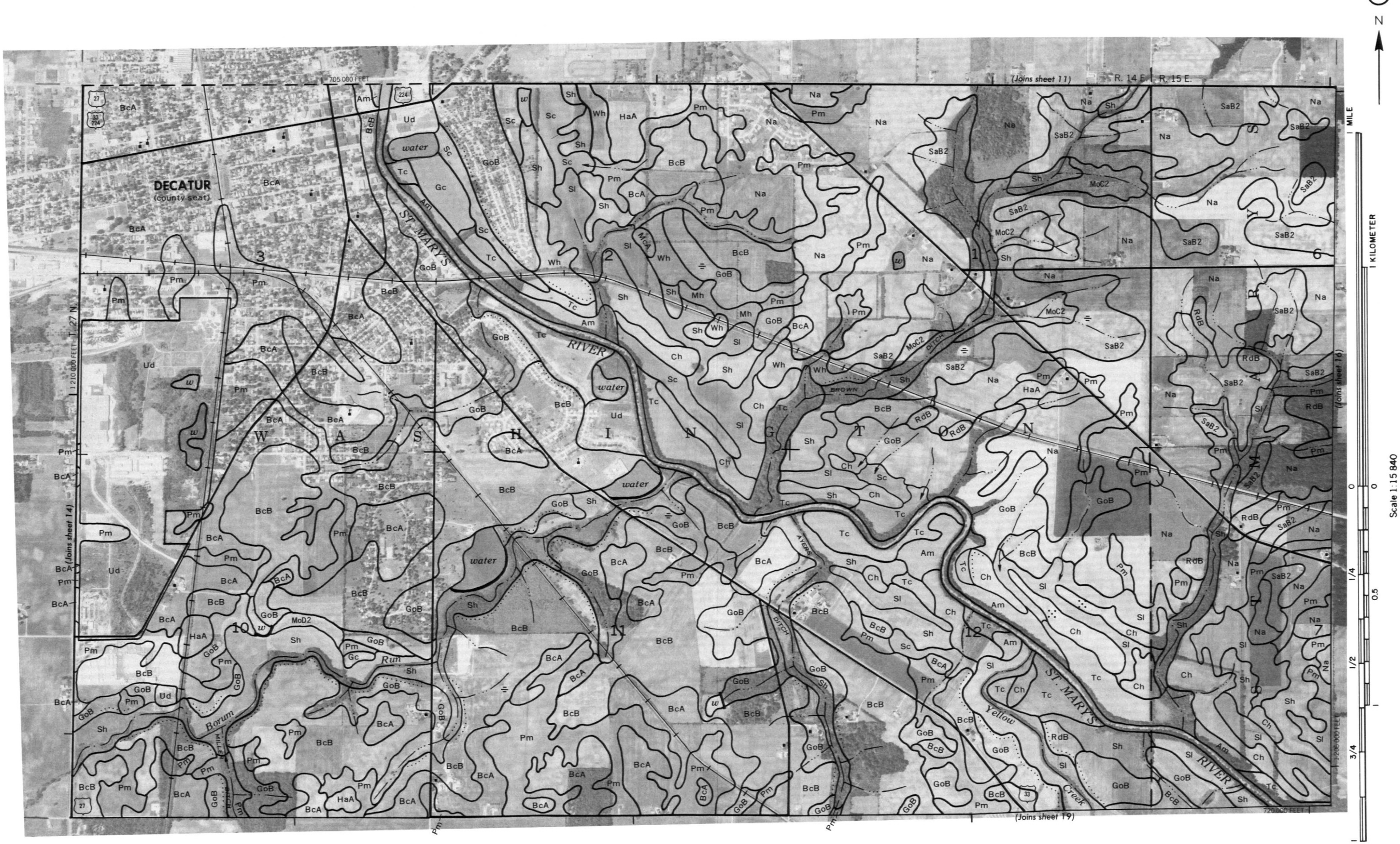
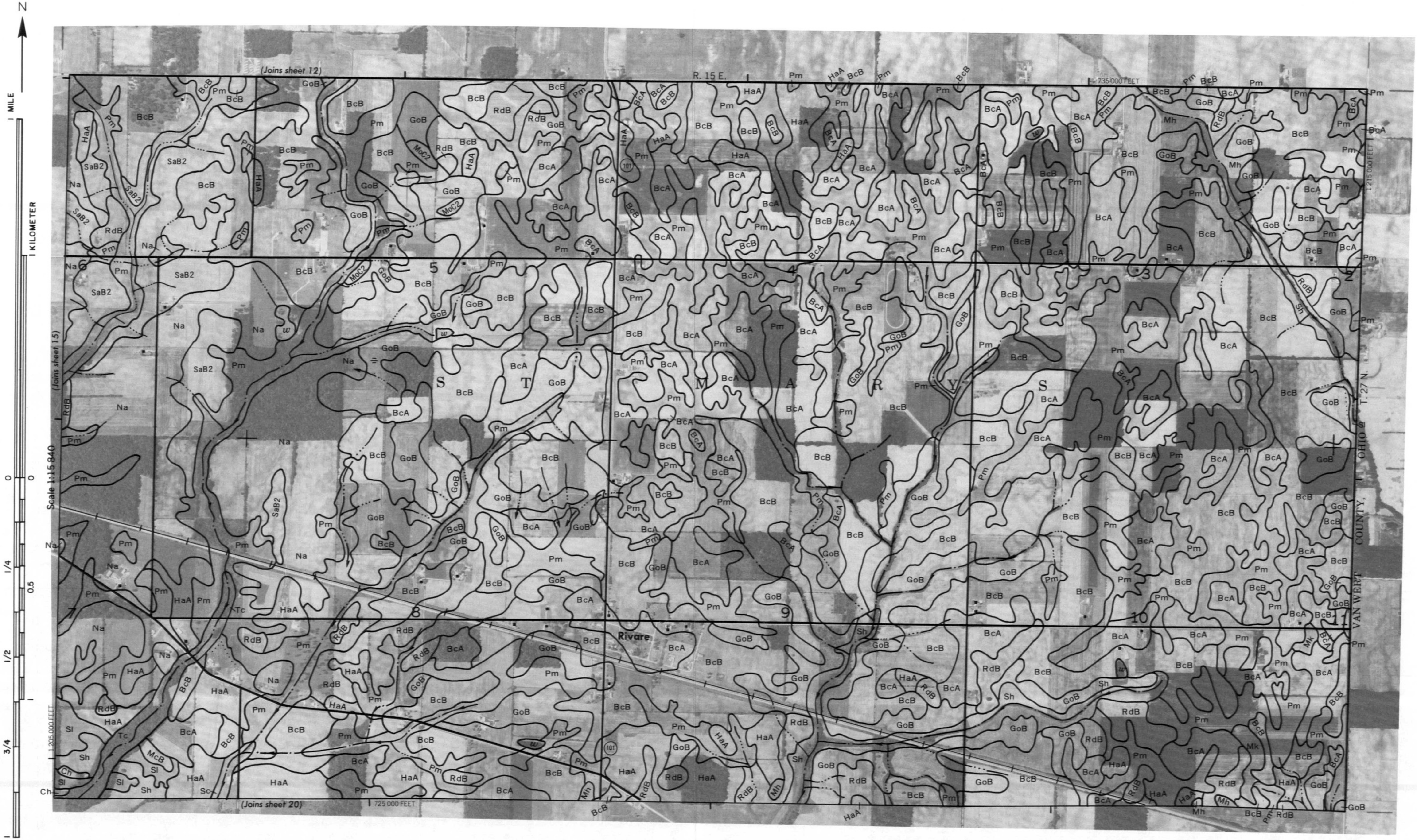
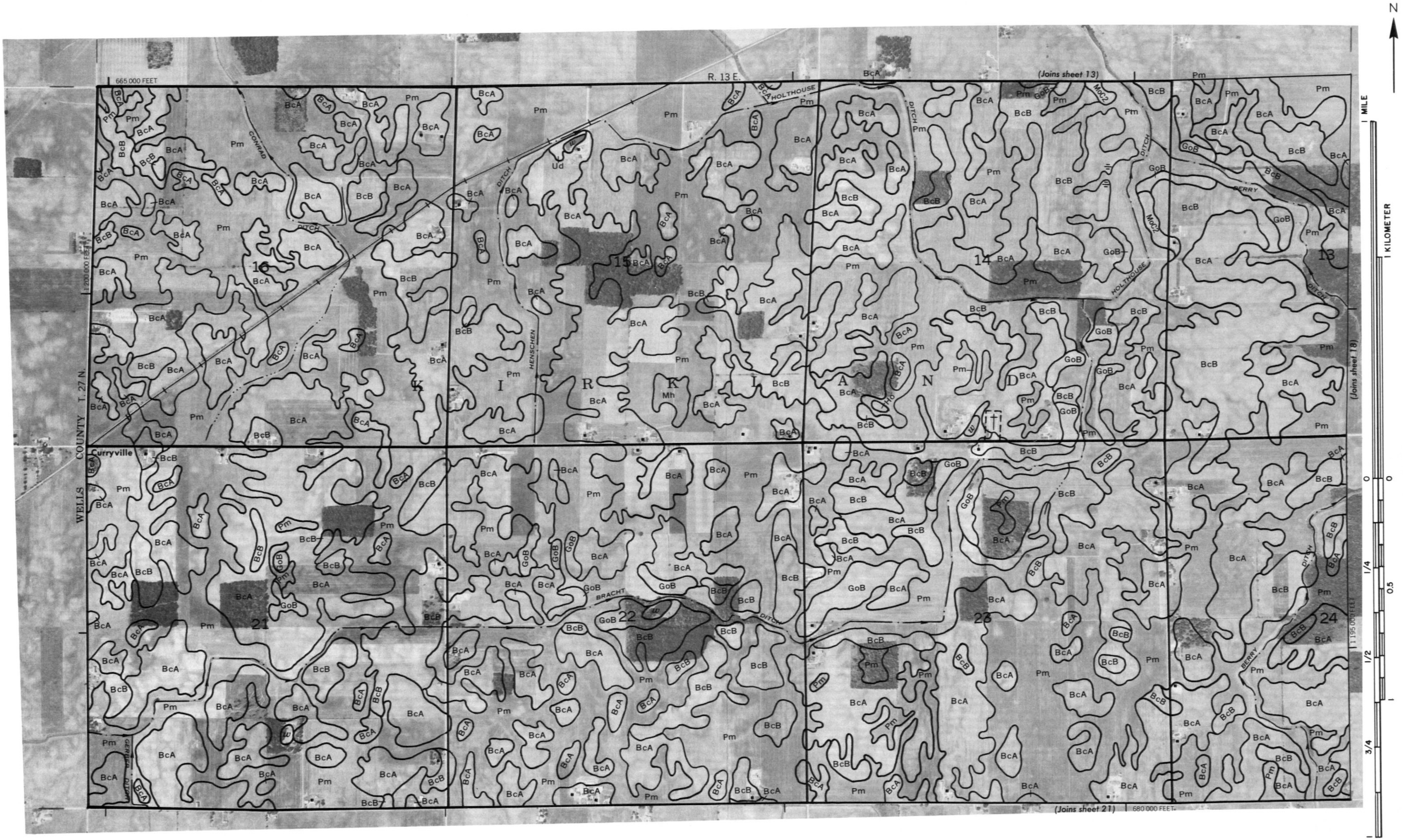
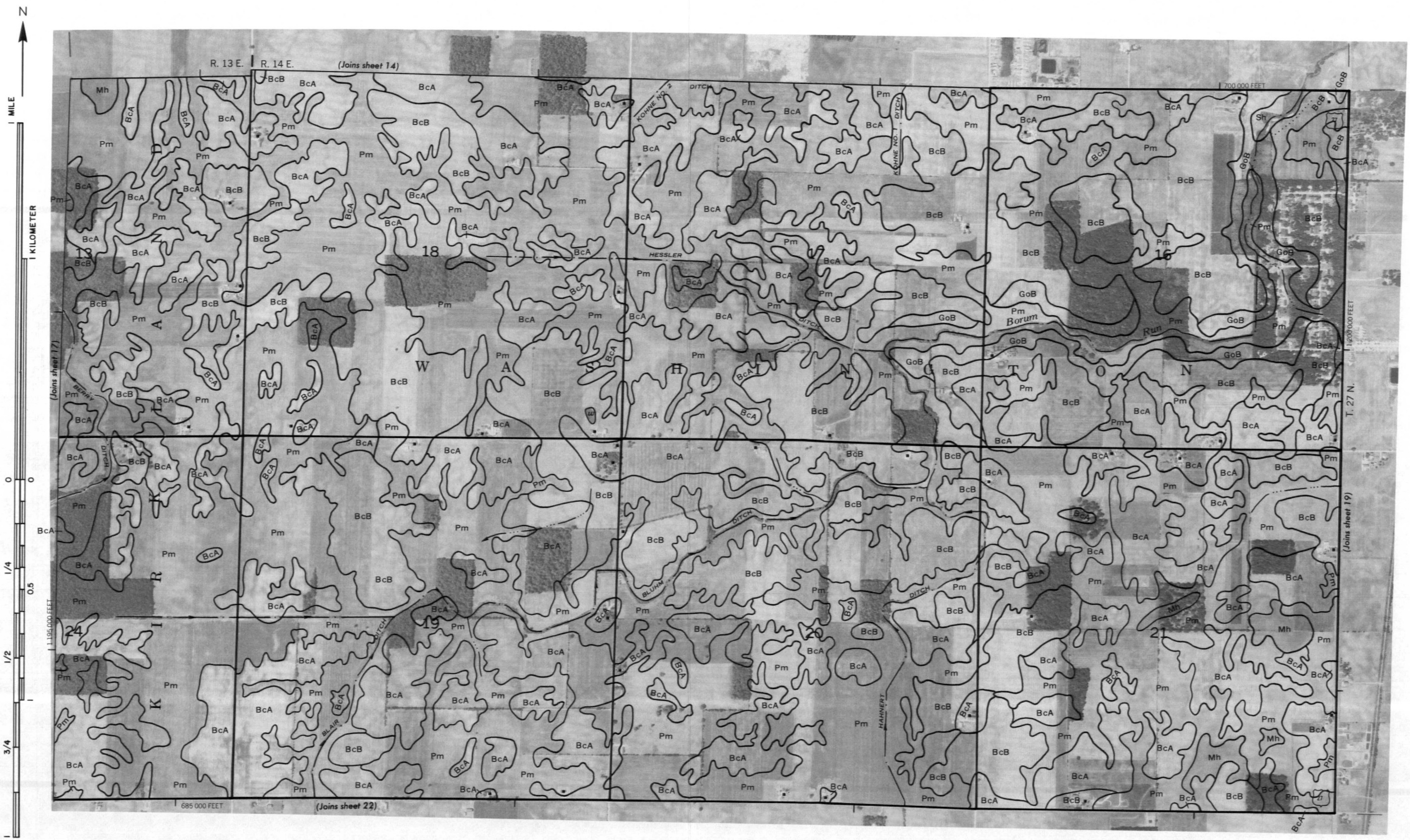
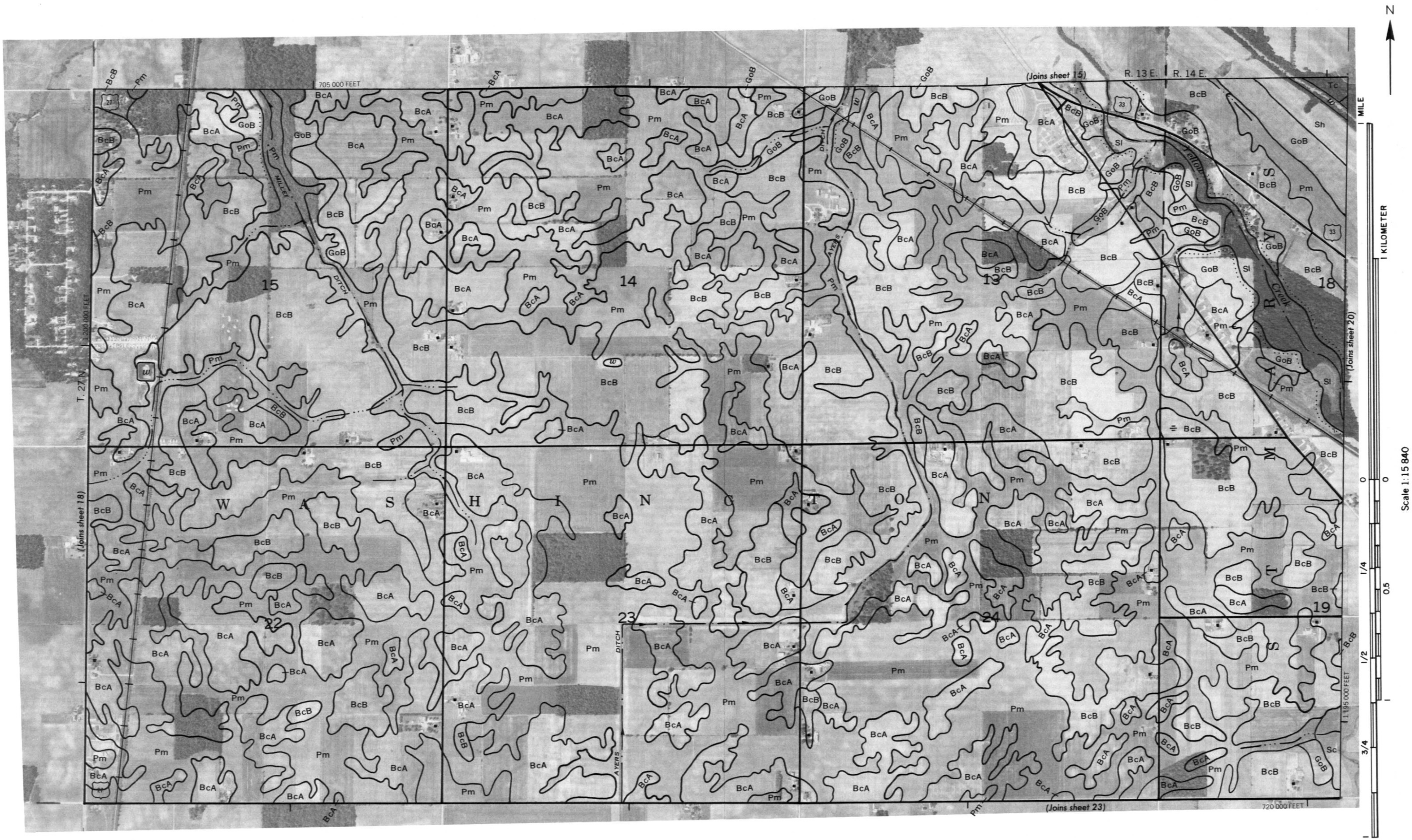
McB
Sh
Tc
Ud
w

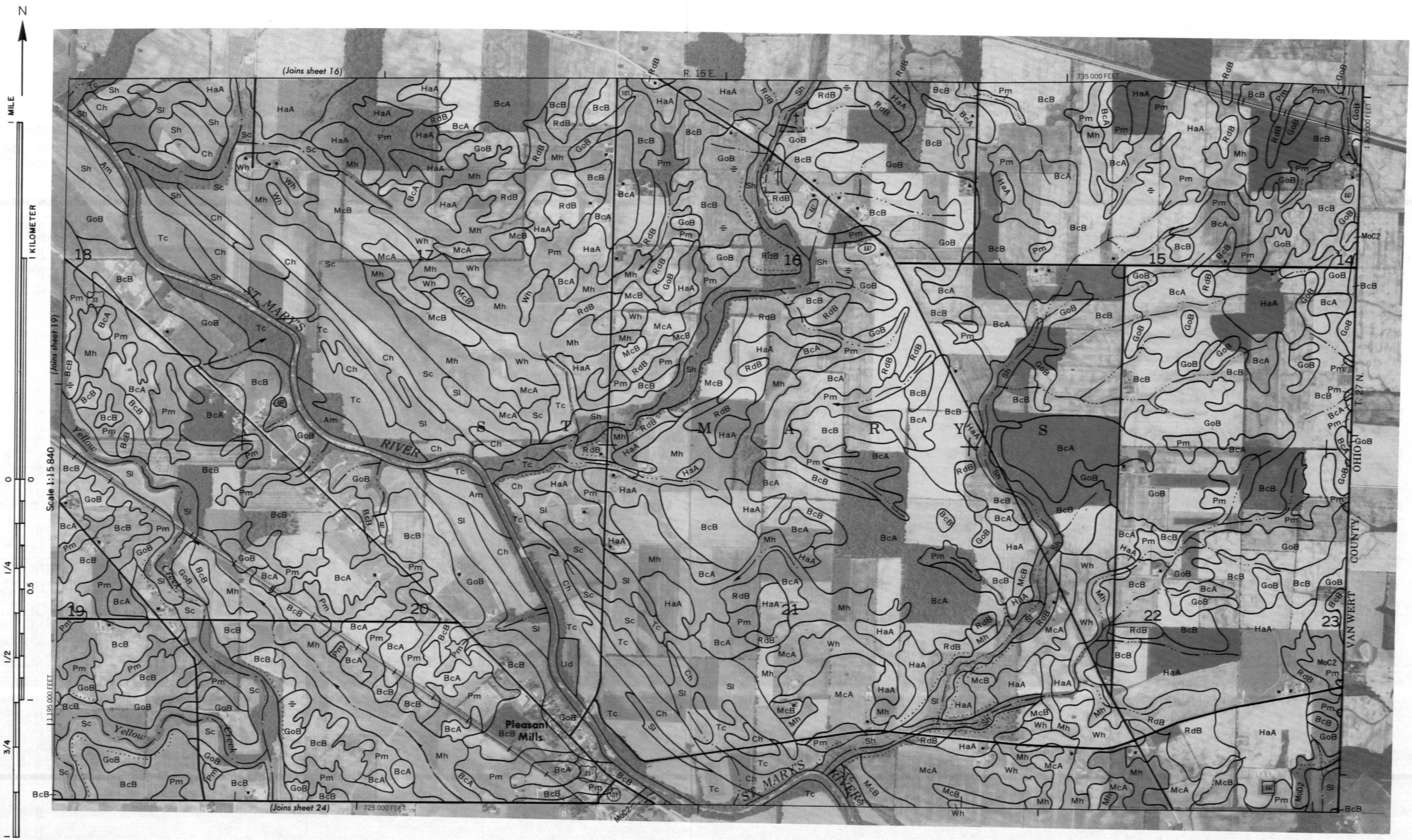

15
N
DECATUR
(county seat)
ST MARYS RIVER
BROWN DITCH
AYERS DITCH
Borum Run
Yellow Creek
WASHINGTON
(Joins sheet 11)
(Joins sheet 19)
(Joins sheet 14)
(Joins sheet 16)
R. 14 E. R. 15 E.
T. 27 N.
705 000 FEET
720 000 FEET
1 210 000 FEET
1 200 000 FEET
1 MILE
1 KILOMETER
Scale 1:15 840

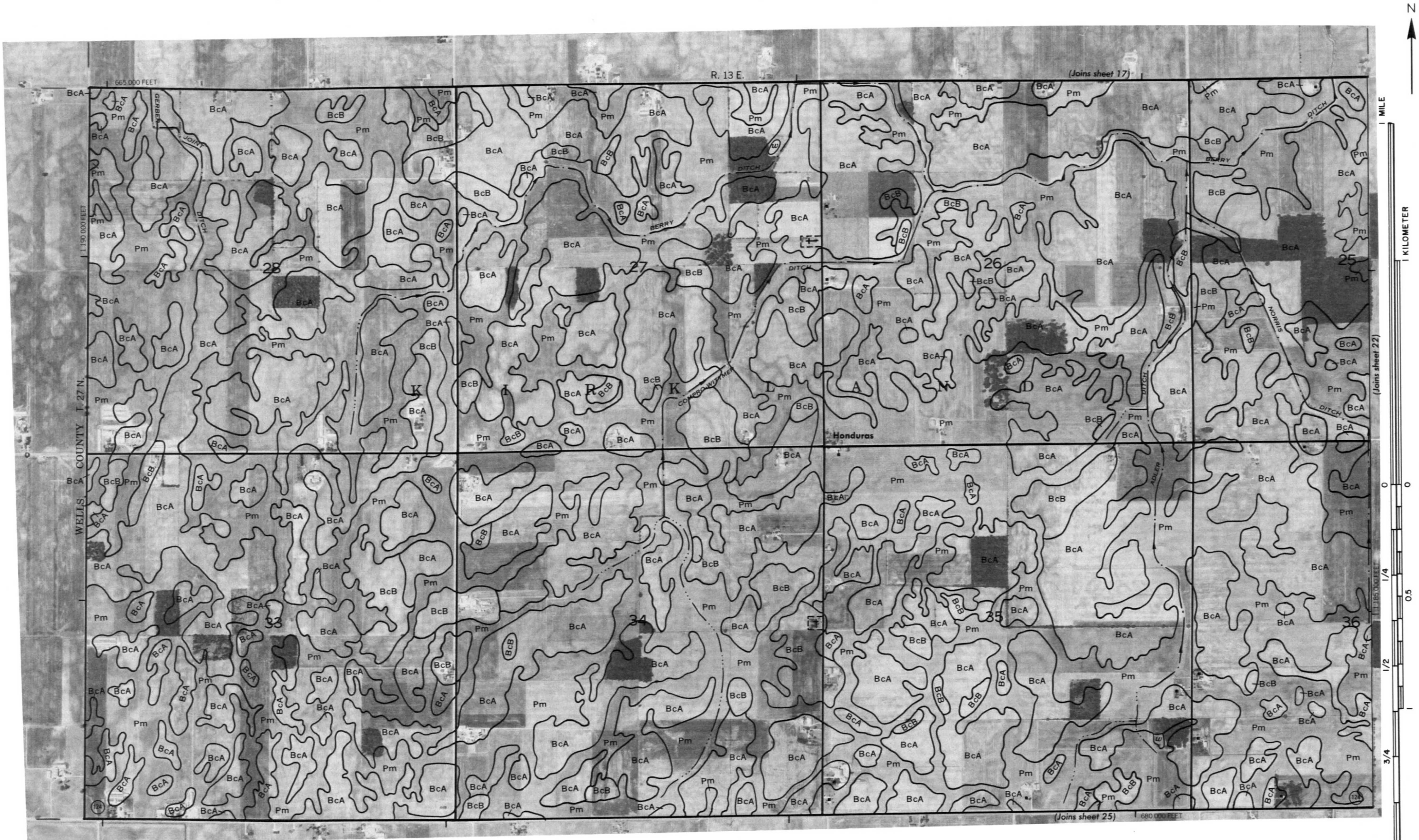

N
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0
0.5
(Joins sheet 12)
R. 15 E.
735 000 FEET
1 215 000 FEET
(Joins sheet 15)
Scale 1:15 840
S T M A R Y S
T. 27 N.
OHIO
VAN WERT COUNTY
Rivare
1 205 000 FEET
(Joins sheet 20)
725 000 FEET
1
2
3
4
5
6
7
8
9
10
11


N
(Joins sheet 13)
(Joins sheet 18)
(Joins sheet 21)
665 000 FEET
680 000 FEET
1 200 000 FEET
1 195 000 FEET
R. 13 E.
T. 27 N.
WELLS COUNTY
Curryville
K I R K L A N D
HOLTHOUSE DITCH
CONRAD DITCH
HENSCHEN DITCH
BRACHT DITCH
BERRY DITCH
GERBER DITCH
13
14
15
16
21
22
23
24
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
0.5
Scale 1:15 840

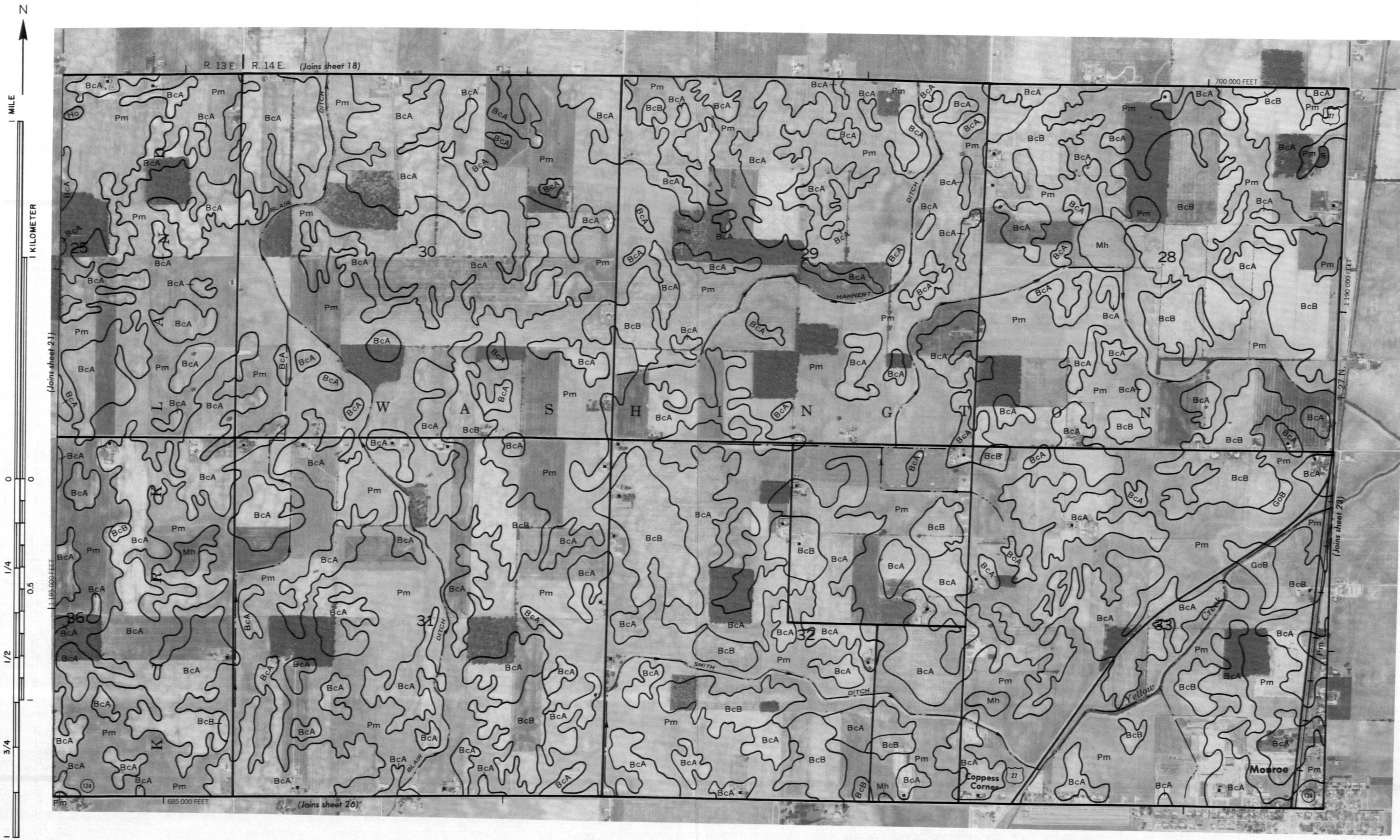

N
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
R. 13 E.
R. 14 E.
(Joins sheet 14)
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 22)
T. 27 N.
700 000 FEET
685 000 FEET
1 200 000 FEET
1 195 000 FEET
KIRKLAND
WASHINGTON
13
18
17
16
24
19
20
21
KOHNE NO. 2 DITCH
KOHNE NO. 1 DITCH
HESSLER DITCH
Borum Run
BERRY DITCH
BLUHM DITCH
BLAIR DITCH
HAHNERT DITCH
BcA
BcB
Pm
Mh
GoB
Sh

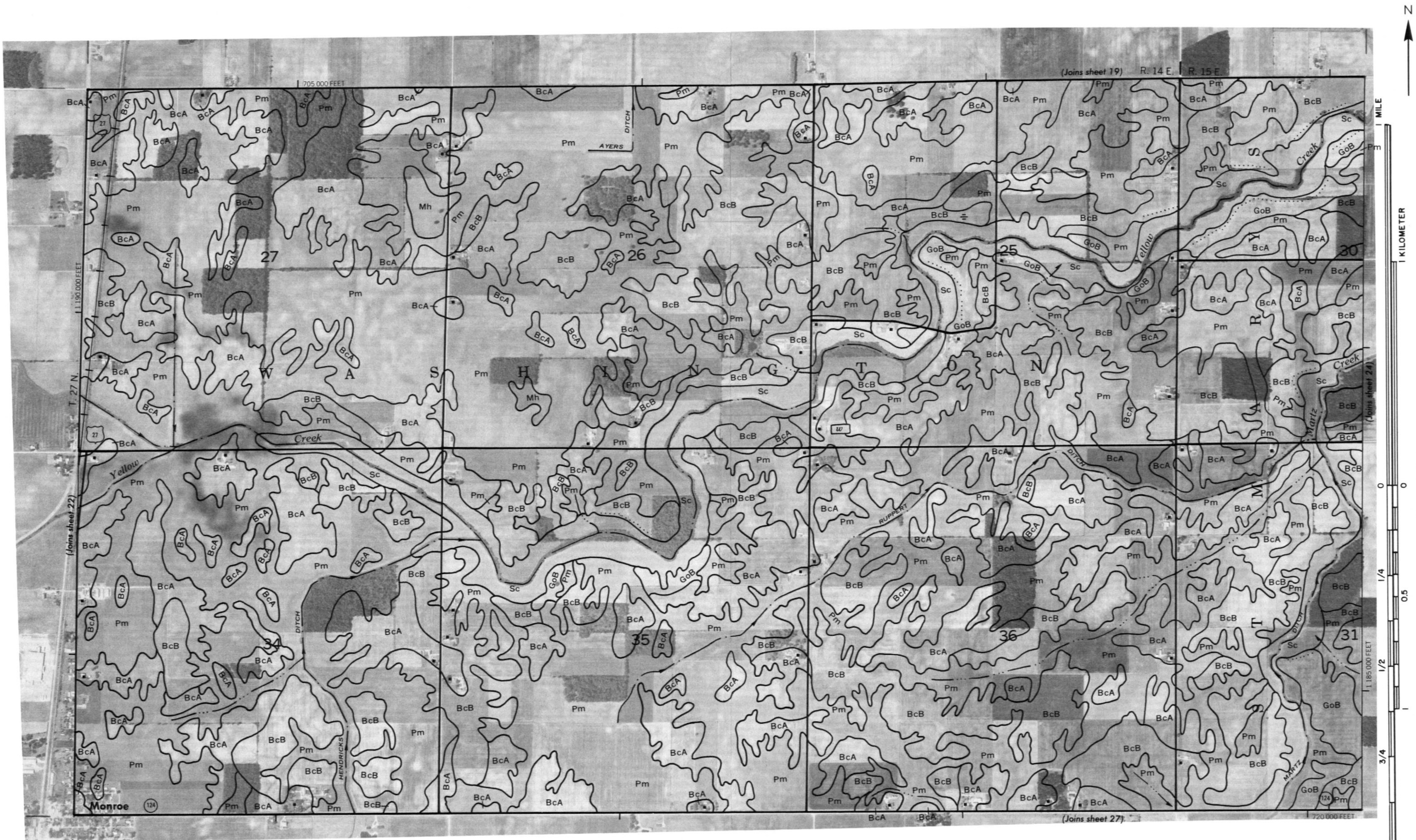

N
(Joins sheet 15)
R. 13 E.
R. 14 E.
705 000 FEET
720 000 FEET
T. 27 N.
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 23)
MILLER DITCH
AYERS DITCH
Yellow Creek
W A S H I N G T O N
S T. M A R Y S
15
14
13
18
22
23
24
19
MILE
KILOMETER
Scale 1:15 840

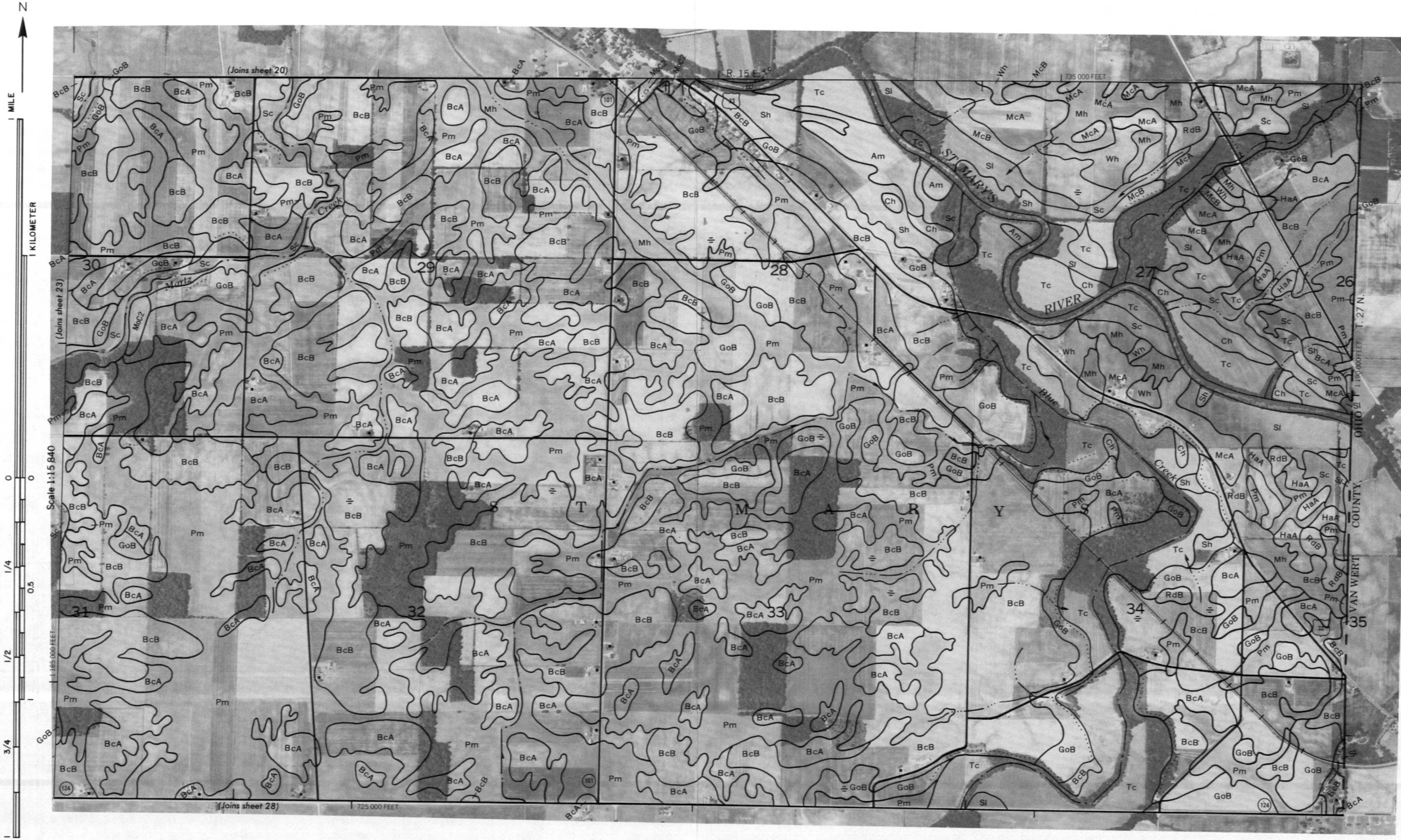

N
1 MILE
1 KILOMETER
Scale 1:15 840
(Joins sheet 16)
(Joins sheet 24)
(Joins sheet 19)
R. 15 E.
T. 27 N.
735 000 FEET
725 000 FEET
1 195 000 FEET
ST. MARY'S RIVER
S T M A R Y S
Yellow Creek
Pleasant Mills
VAN WERT COUNTY, OHIO

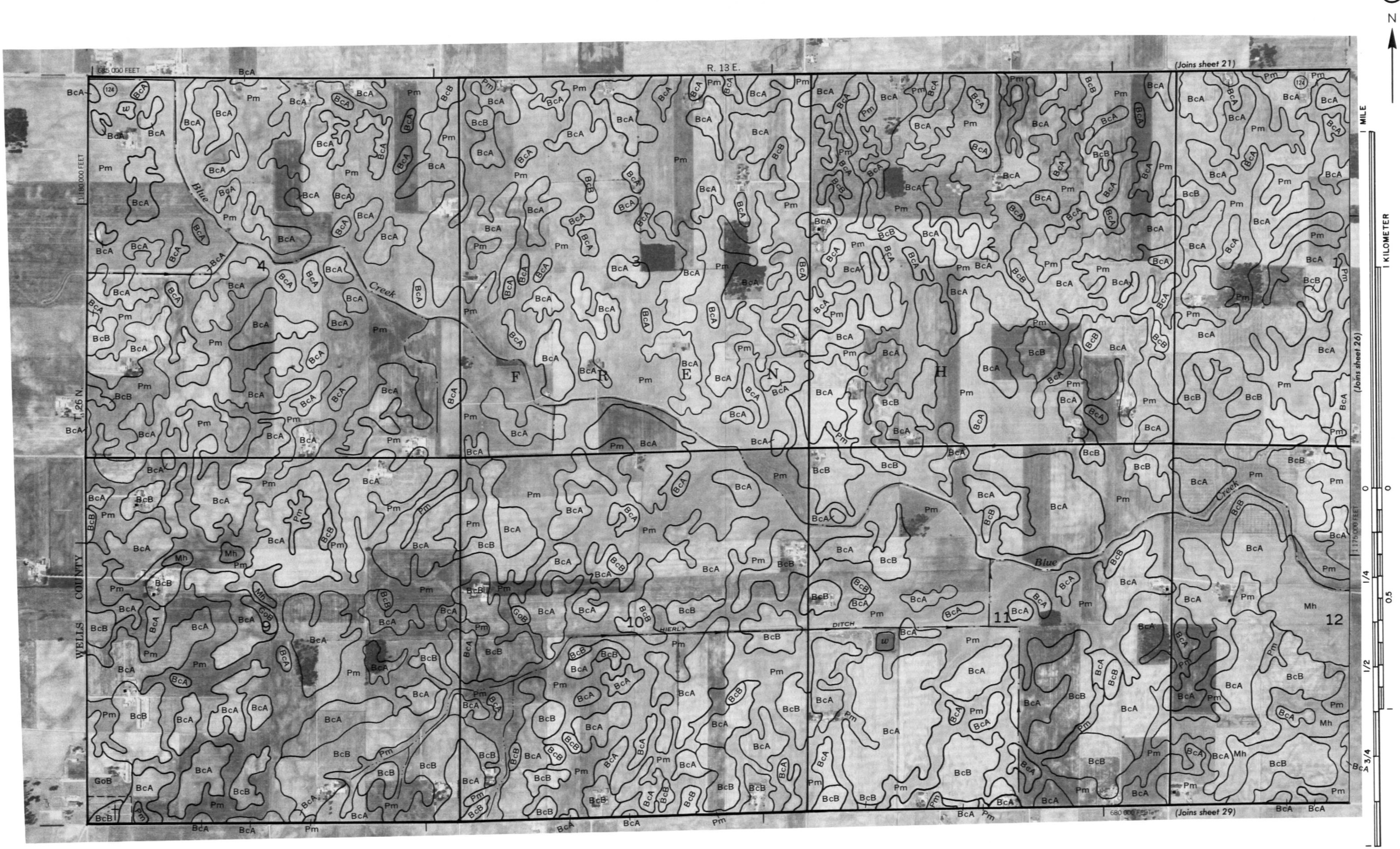

N
R. 13 E.
(Joins sheet 17)
(Joins sheet 22)
(Joins sheet 25)
665 000 FEET
680 000 FEET
1 190 000 FEET
1 185 000 FEET
WELLS COUNTY
T. 27 N.
K I R K L A N D
Honduras
GERBER JOINT DITCH
BERRY DITCH
COMPRO-WITTMER DITCH
NORRIS DITCH
ADLER DITCH
28
27
26
25
33
34
35
36
BcA
BcB
Pm
1 MILE
1 KILOMETER
Scale 1:15 840

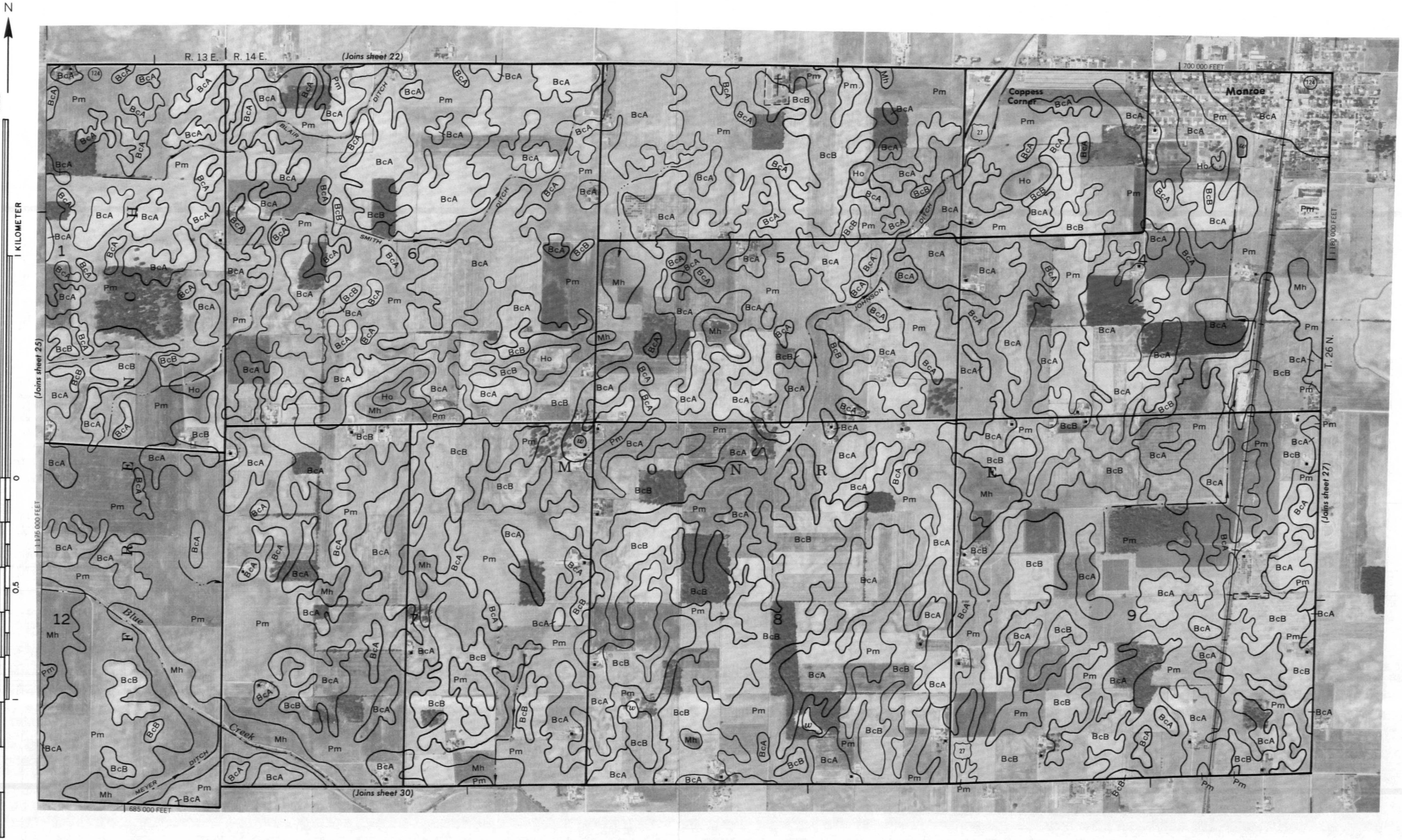
ADAMS COUNTY, INDIANA — SHEET NUMBER 22

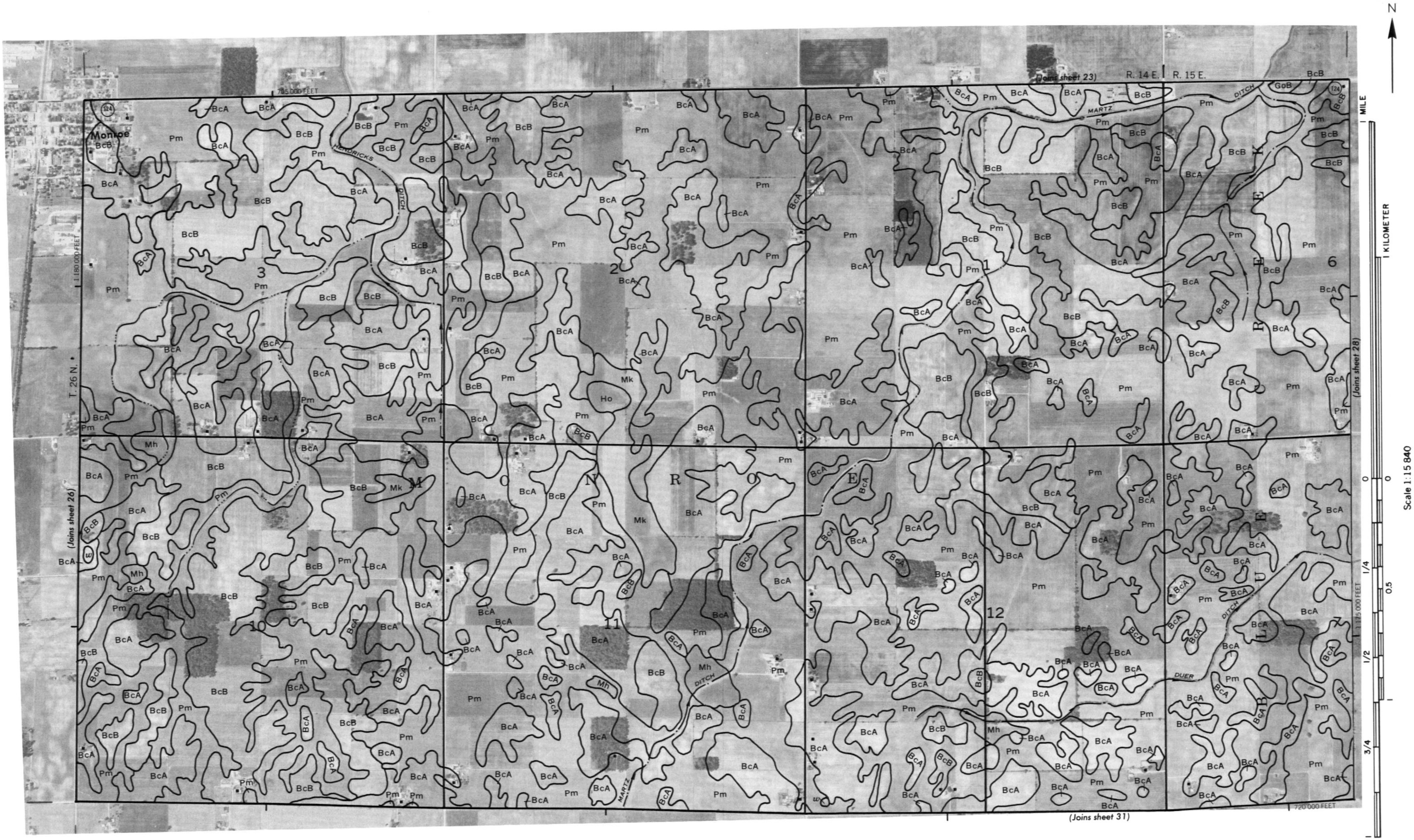


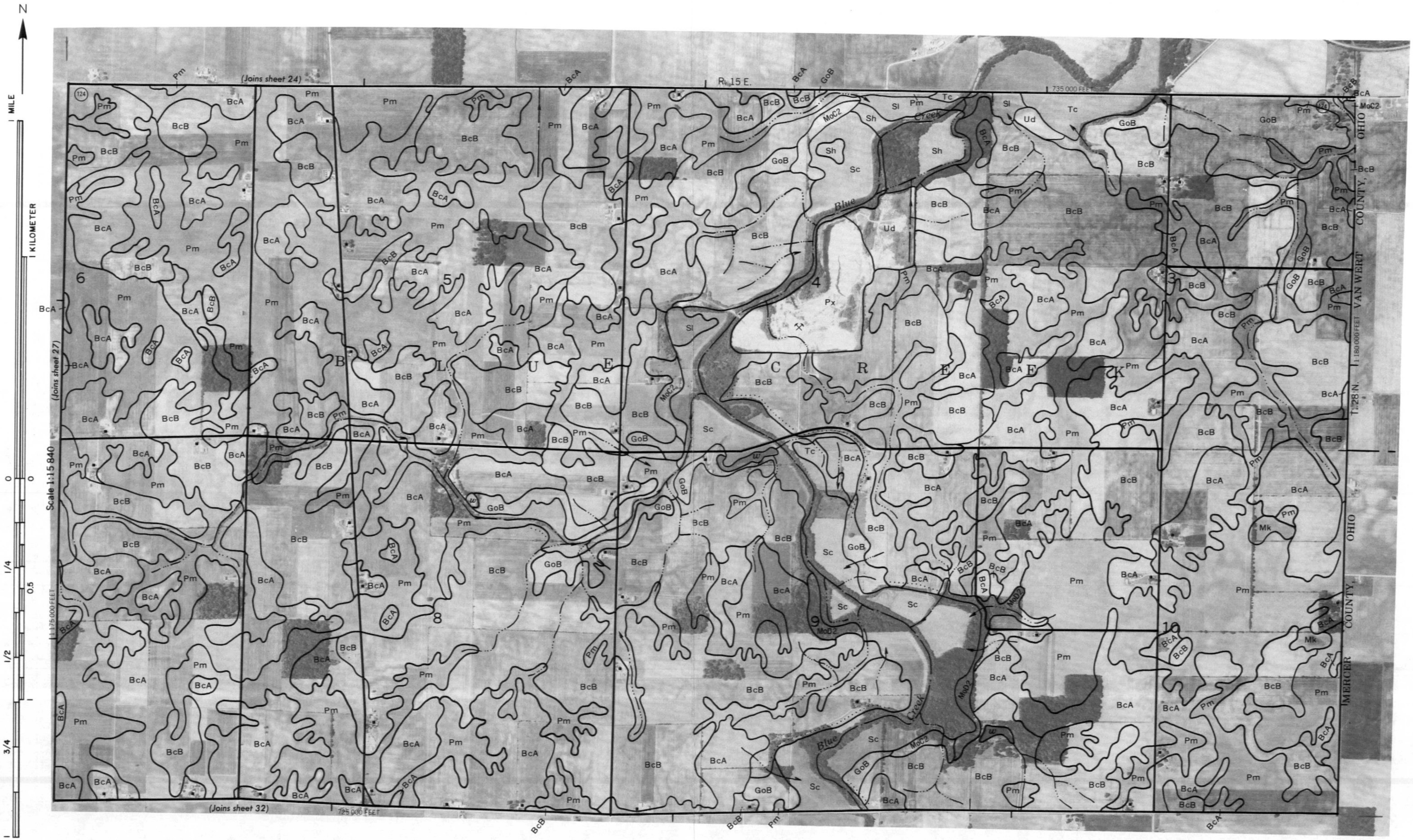

N
(Joins sheet 19)
R. 14 E.
R. 15 E.
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 27)
T. 27 N.
705 000 FEET
720 000 FEET
1 190 000 FEET
1 185 000 FEET
W A S H I N G T O N
T O W N S H I P
27
26
25
30
34
35
36
31
Yellow Creek
Martz Creek
AYERS DITCH
RUPPERT DITCH
HENDRICKS DITCH
MARTZ DITCH
Monroe
27
124
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840

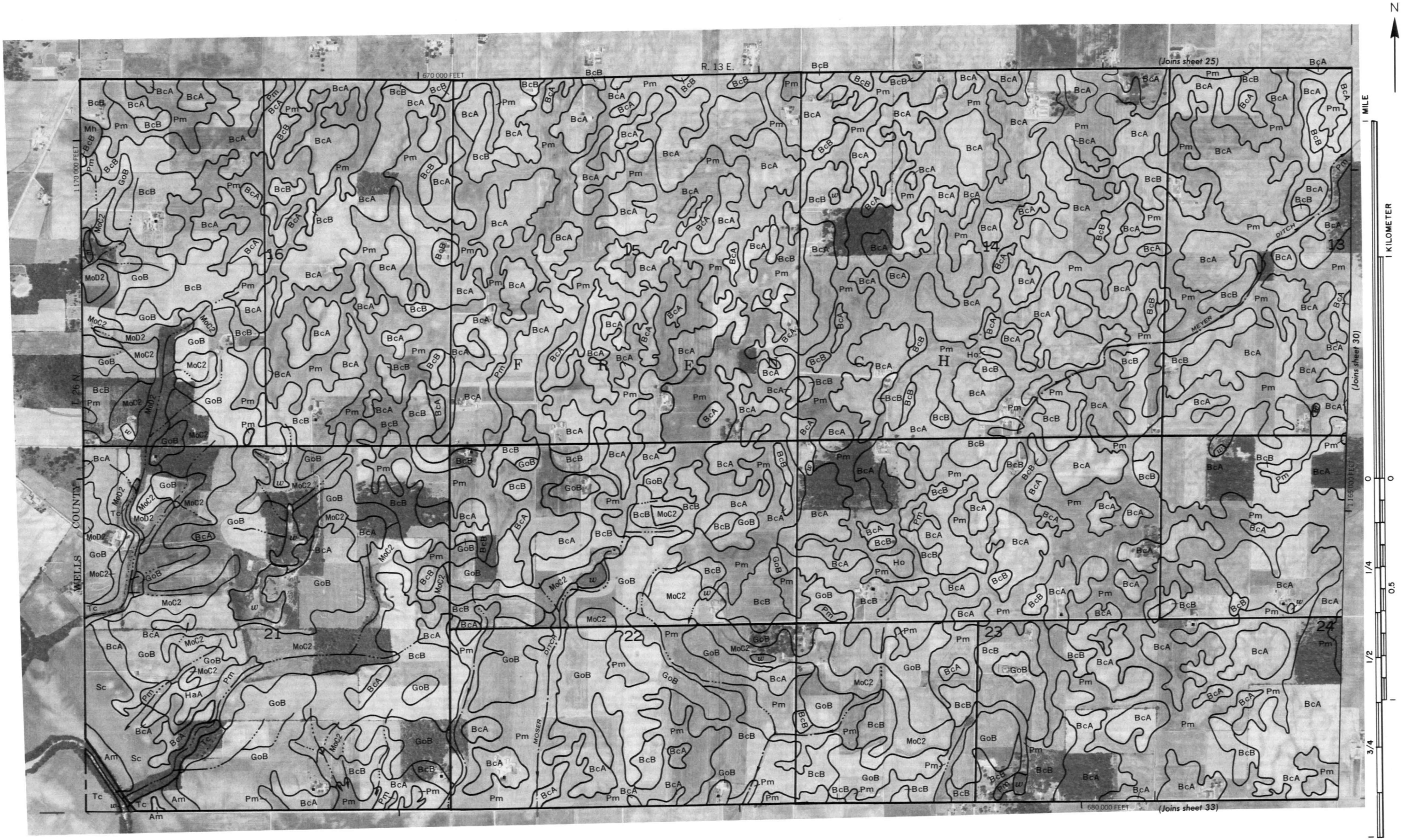

N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0
0.5
1
(Joins sheet 20)
(Joins sheet 23)
(Joins sheet 28)
R. 15 E.
T. 27 N.
735 000 FEET
725 000 FEET
1 190 000 FEET
1 185 000 FEET
ST. MARYS RIVER
Blue Creek
Martz Creek
S T M A R Y S
OHIO
VAN WERT COUNTY
26
27
28
29
30
31
32
33
34
35
101
124
33


N
R. 13 E.
(Joins sheet 21)
(Joins sheet 26)
(Joins sheet 29)
685 000 FEET
1 180 000 FEET
680 000 FEET
1 175 000 FEET
T. 26 N.
WELLS COUNTY
F R E N C H
Blue Creek
HIERLY DITCH
1 MILE
1 KILOMETER
Scale 1:15 840

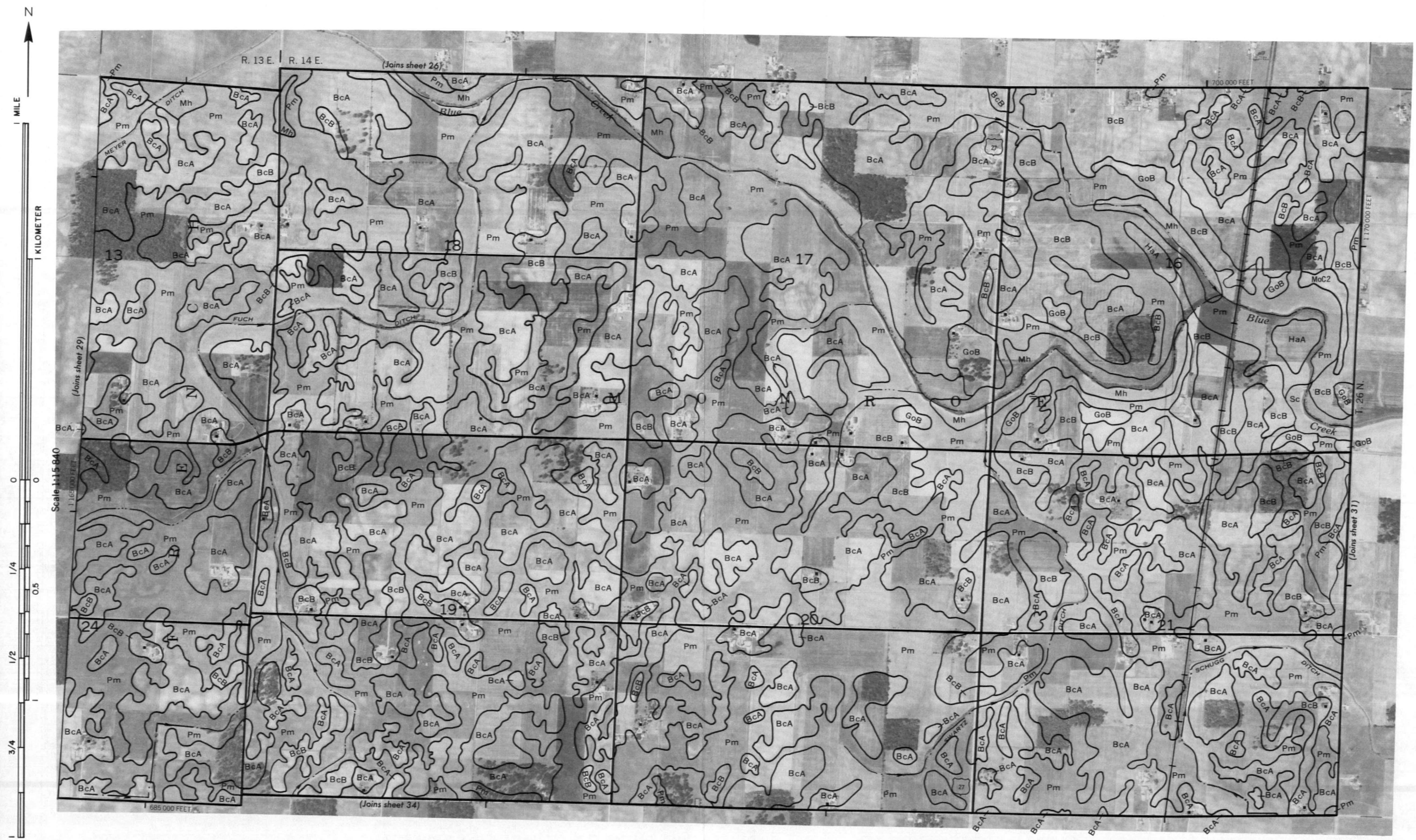

N
MILE
KILOMETER
0
1/4
1/2
3/4
1
0
0.5
1
R. 13 E.
R. 14 E.
(Joins sheet 22)
(Joins sheet 25)
(Joins sheet 27)
(Joins sheet 30)
T. 26 N.
Monroe
Coppess Corner
700 000 FEET
685 000 FEET
1 175 000 FEET
1 180 000 FEET
BLAIR
DITCH
SMITH
JOHNSON
Blue
Creek
MEYER
DITCH
M O N R O E
F R E N C H

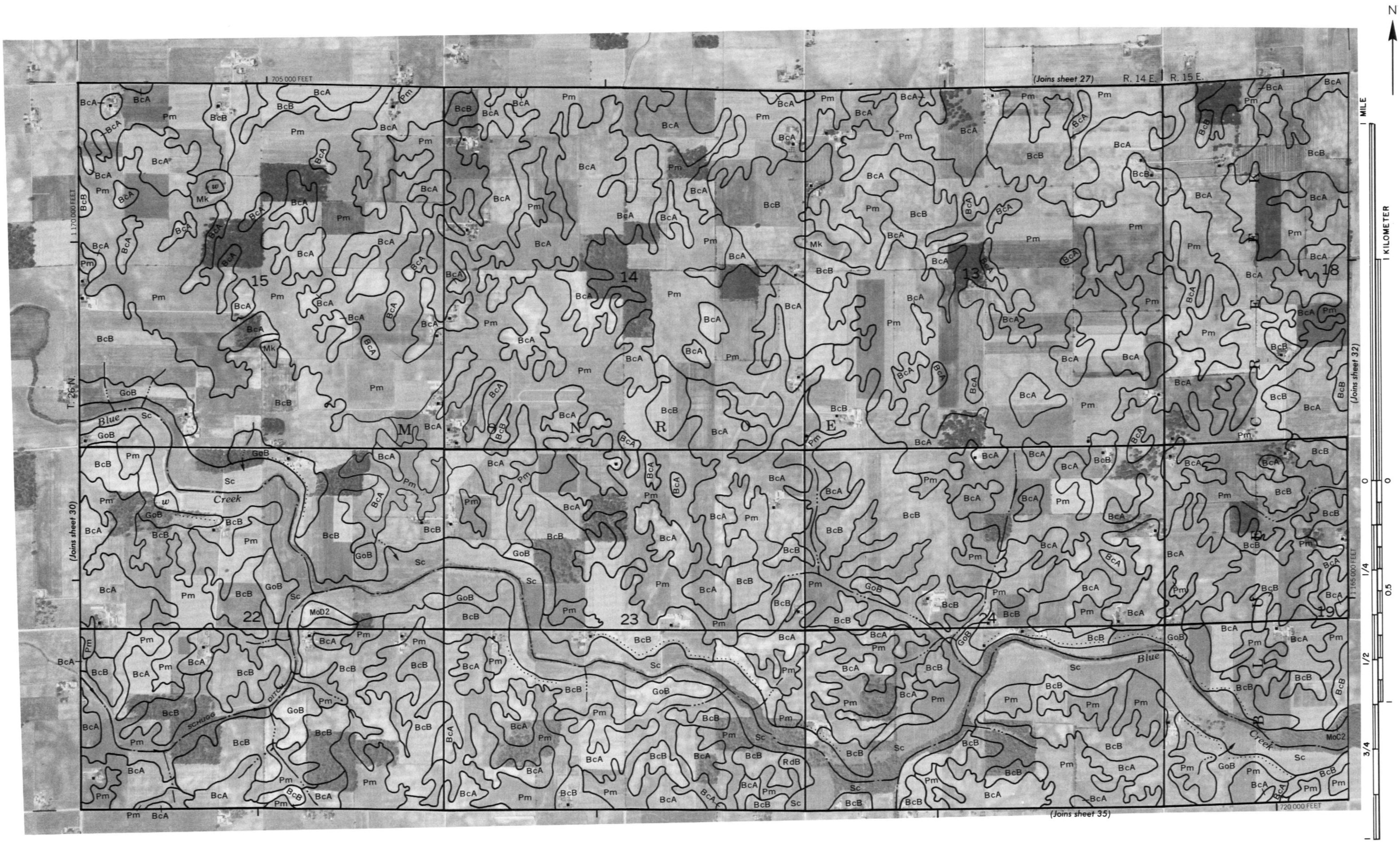

N
(Joins sheet 23)
R. 14 E.
R. 15 E.
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 31)
T. 26 N.
Monroe
HENDRICKS DITCH
MARTZ DITCH
DUER DITCH
M O N R O E
B L U E C R E E K
785 000 FEET
720 000 FEET
1 180 000 FEET
1 175 000 FEET
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5

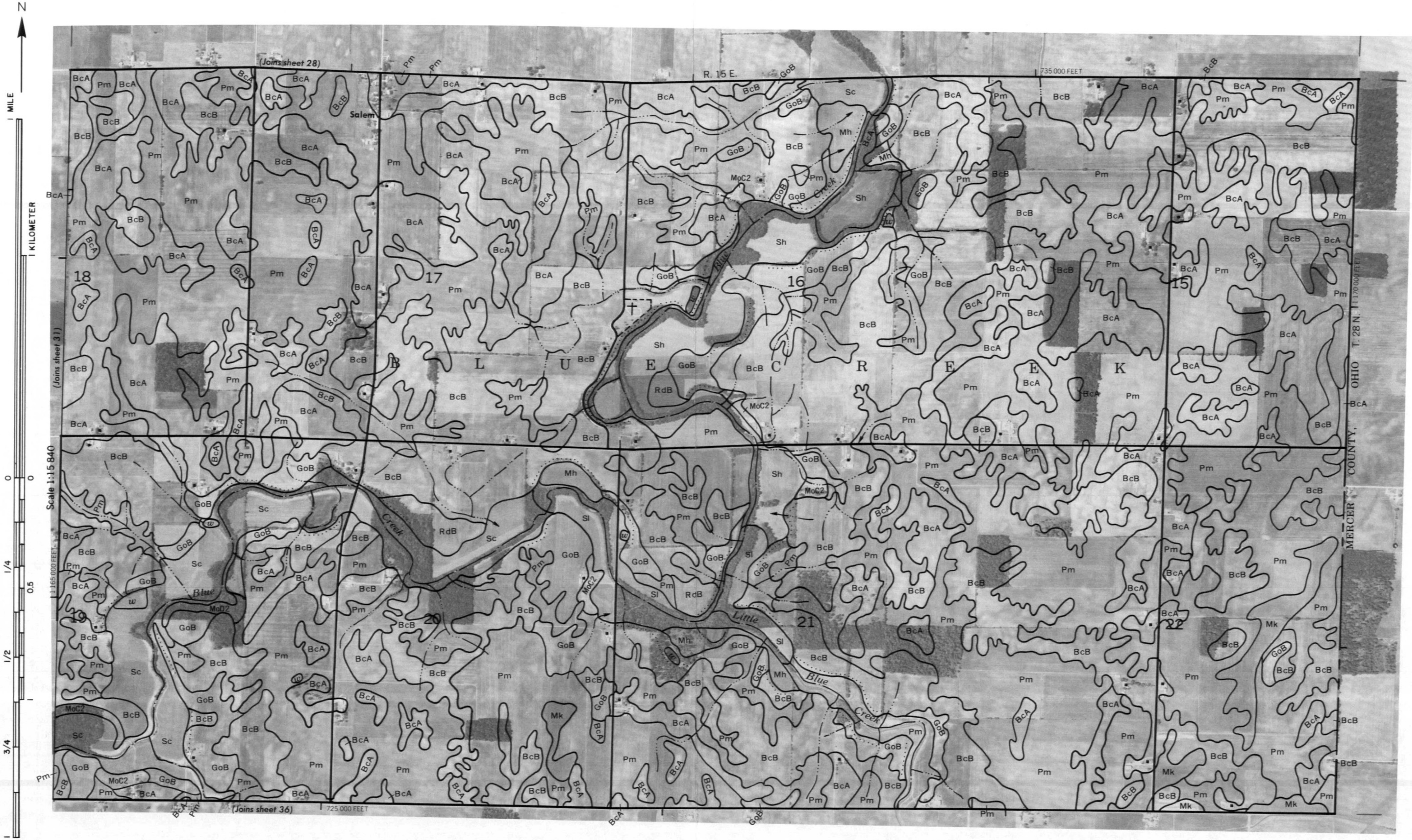

N
MILE
KILOMETER
Scale 1:15 840
(Joins sheet 24)
(Joins sheet 27)
(Joins sheet 32)
R. 15 E.
T. 28 N.
735 000 FEET
725 000 FEET
1 180 000 FEET
1 175 000 FEET
BLUE CREEK
Blue Creek
VAN WERT COUNTY, OHIO
MERCER COUNTY, OHIO
124
3
4
5
6
7
8
9
10
BcA
BcB
Pm
GoB
MoC2
Sh
Sl
Sc
Tc
Ud
Px
Mk
w

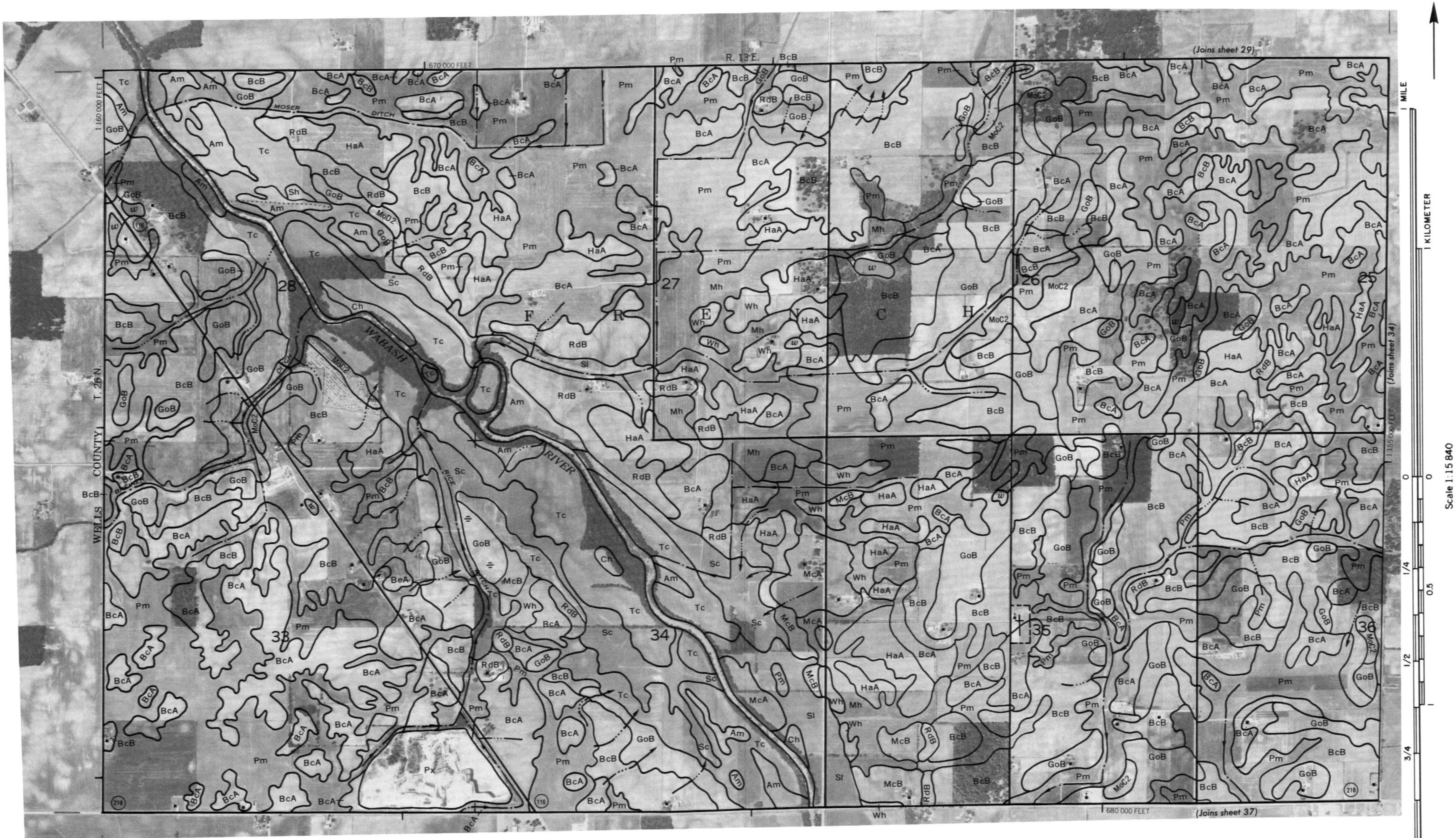

N
(Joins sheet 25)
(Joins sheet 30)
(Joins sheet 33)
R. 13 E.
T. 26 N.
670 000 FEET
680 000 FEET
1 170 000 FEET
1 165 000 FEET
WELLS COUNTY
F R E N C H
MEYER DITCH
MOSER DITCH
16
15
14
13
21
22
23
24
1 MILE
1 KILOMETER
Scale 1:15 840

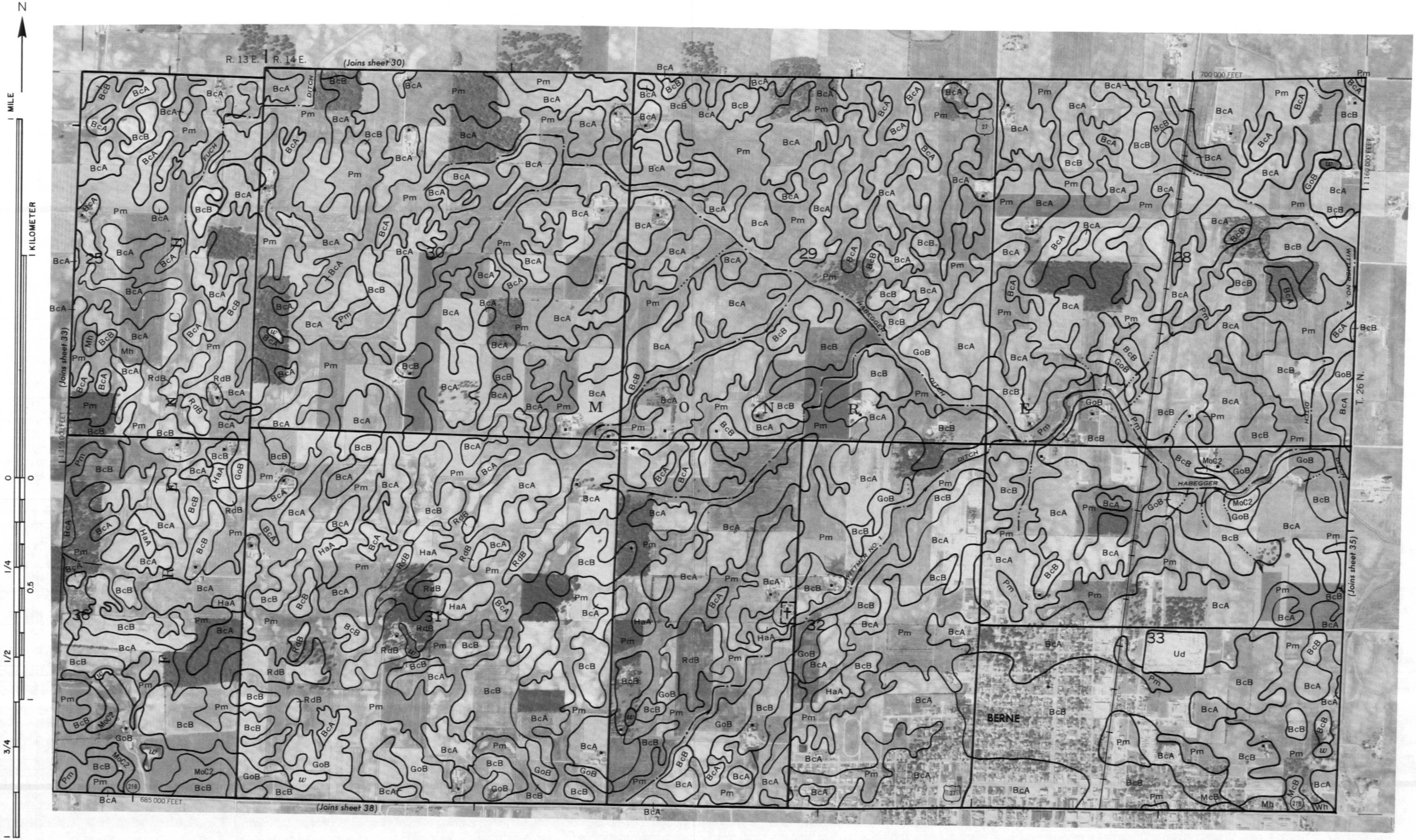
ADAMS COUNTY, INDIANA — SHEET NUMBER 30

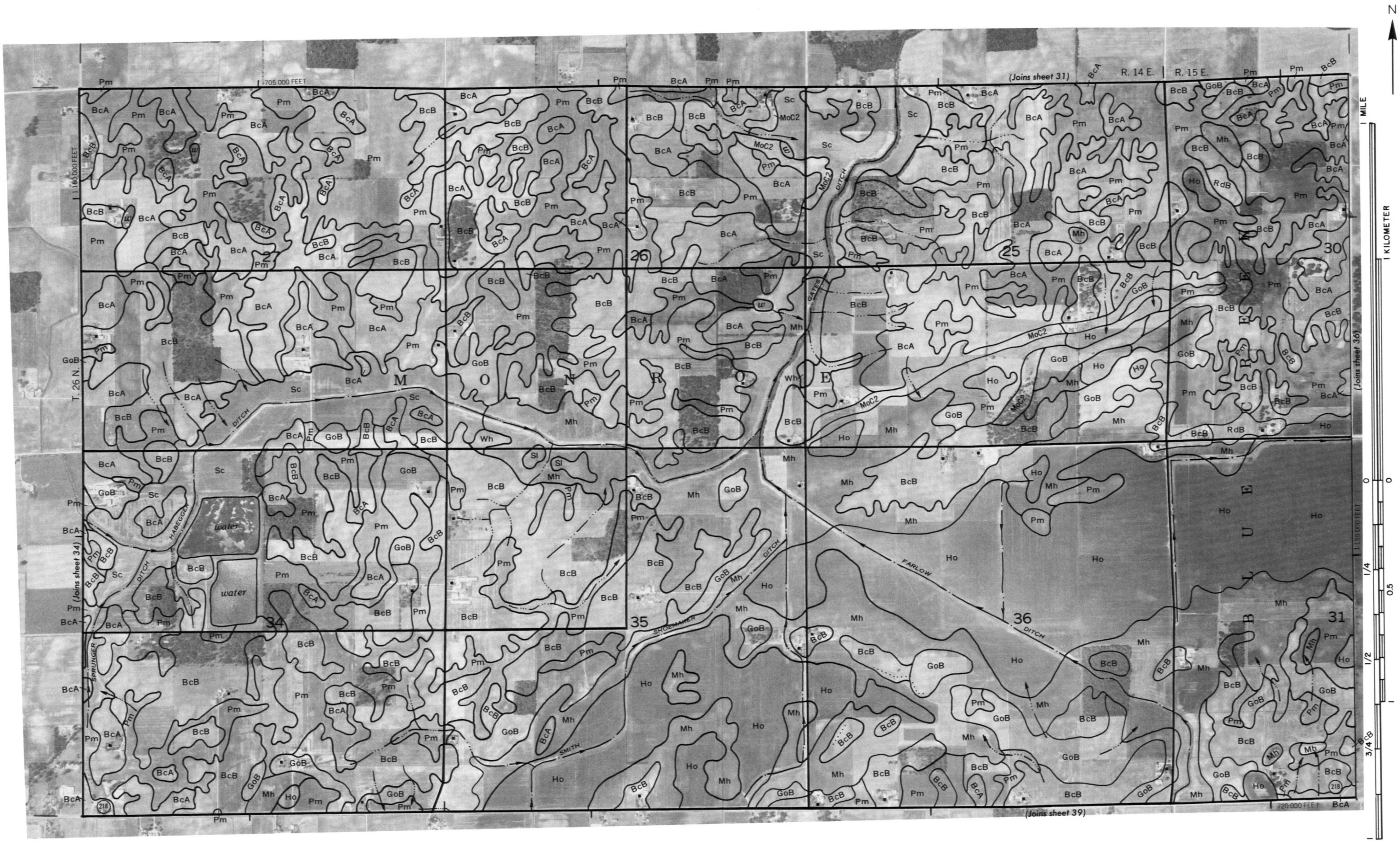


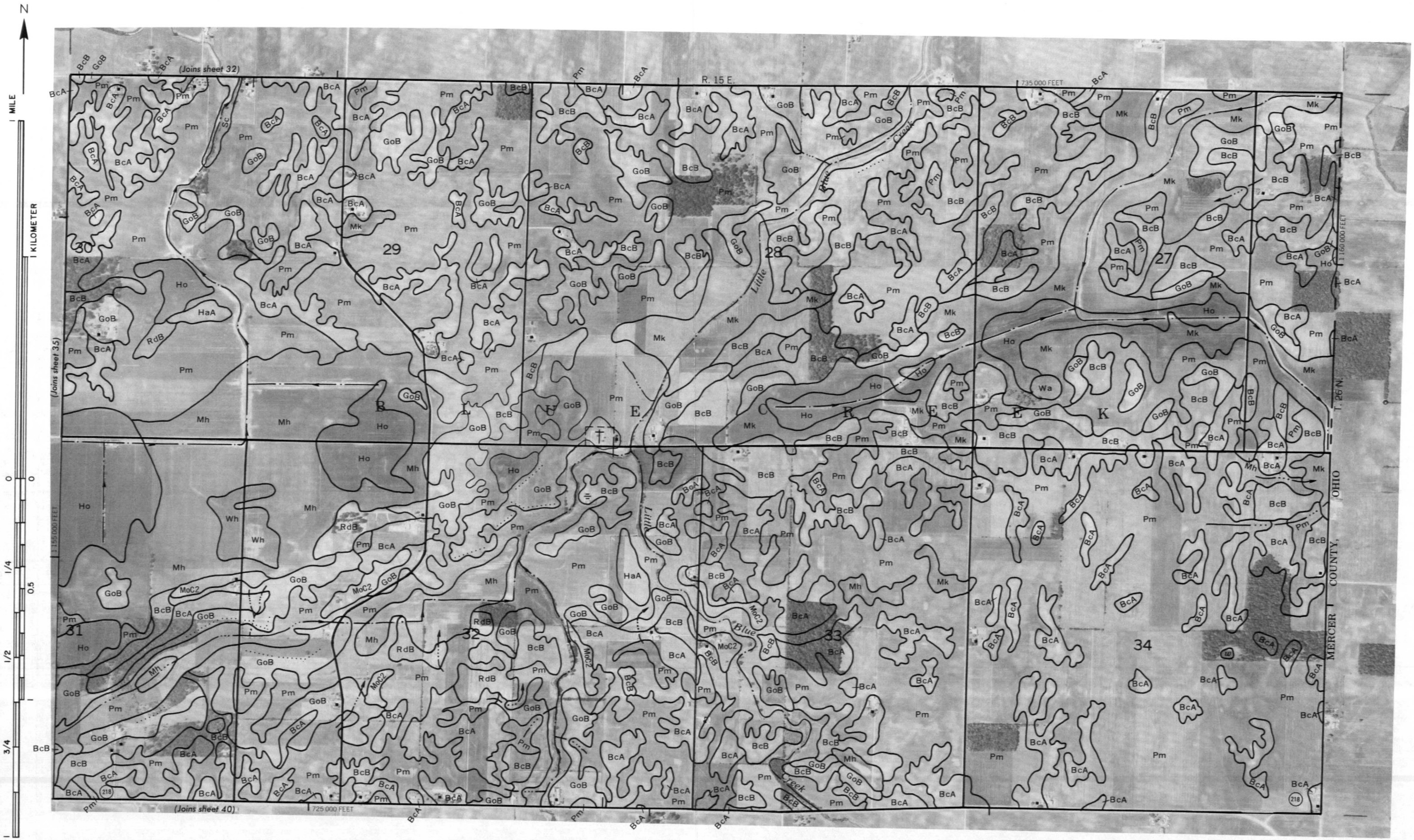

N
(Joins sheet 27)
R. 14 E.
R. 15 E.
705 000 FEET
1 170 000 FEET
T. 26 N.
(Joins sheet 30)
(Joins sheet 32)
(Joins sheet 35)
720 000 FEET
1 165 000 FEET
M O N R O E
15
14
13
18
22
23
24
19
Blue Creek
Schugg Ditch
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840

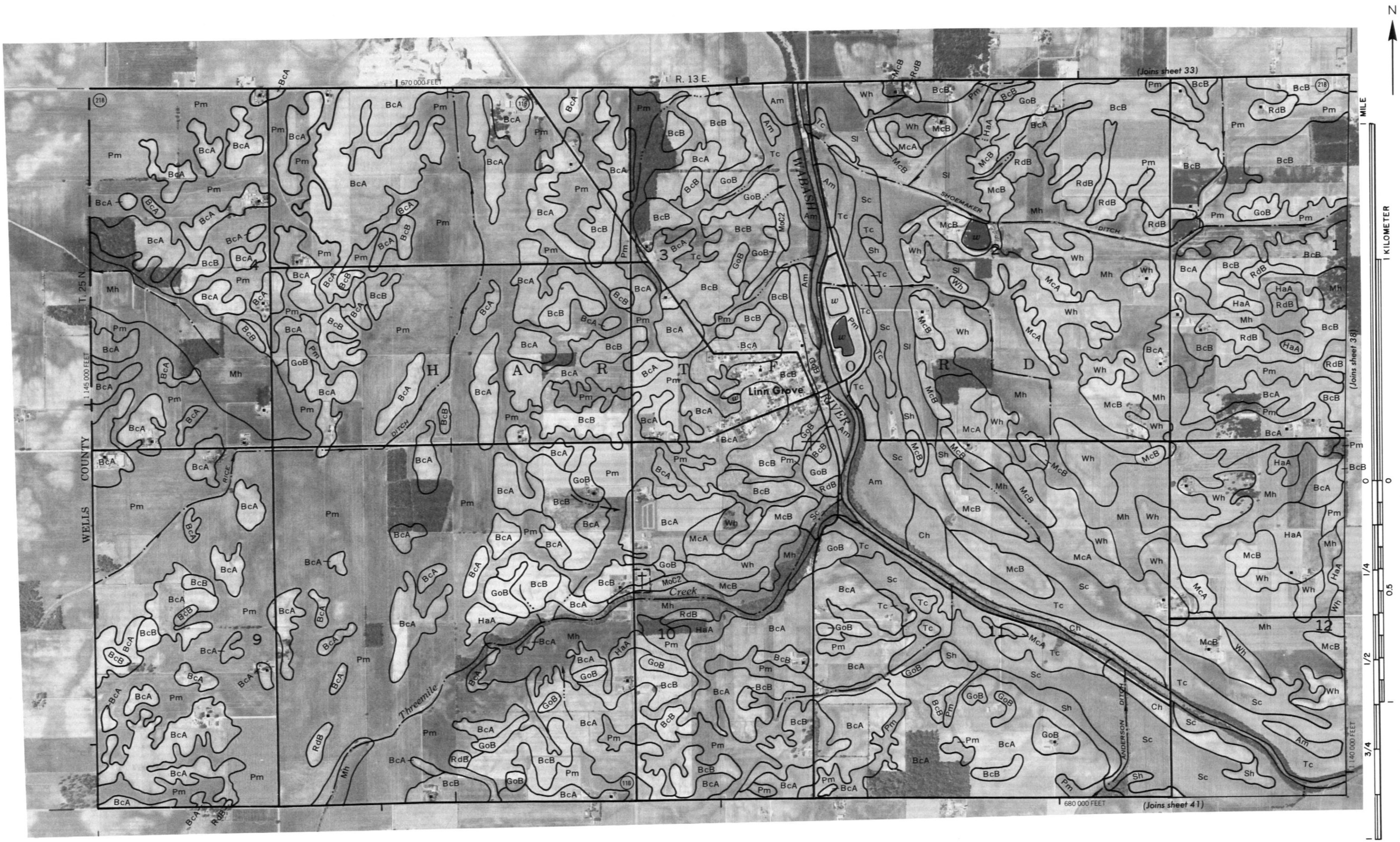

N
MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
1
0.5
(Joins sheet 28)
R. 15 E.
735 000 FEET
Salem
(Joins sheet 31)
(Joins sheet 36)
725 000 FEET
165 000 FEET
170 000 FEET
T. 28 N.
MERCER COUNTY, OHIO
B L U E C R E E K
Blue Creek
Little Blue Creek
15
16
17
18
19
20
21
22
BcA
BcB
Pm
GoB
Sc
Sh
Sl
Mh
Mk
MoC2
MoD2
RdB
w

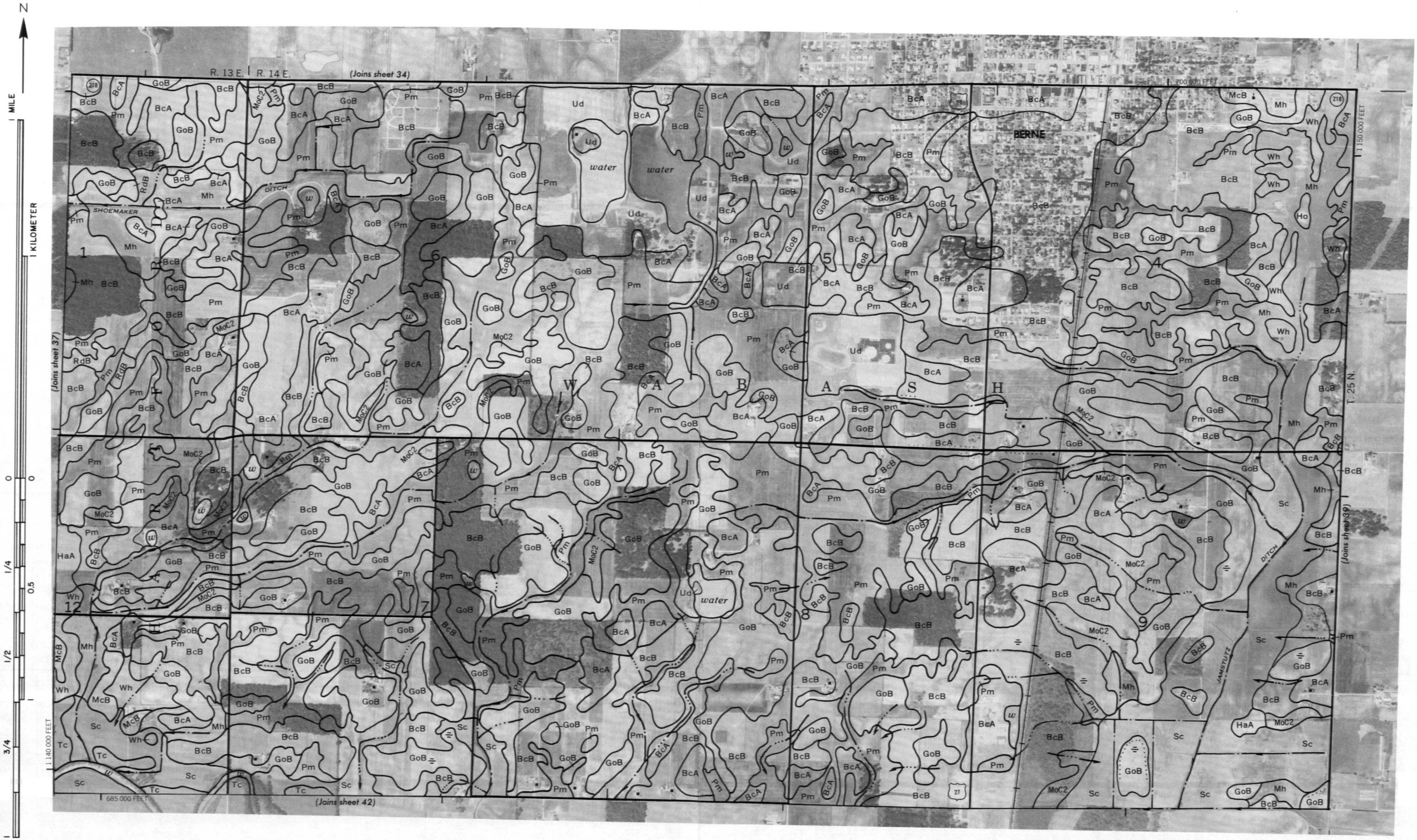

(Joins sheet 29)
(Joins sheet 34)
(Joins sheet 37)
R. 13 E.
T. 26 N.
WELLS COUNTY
WABASH RIVER
MOSER DITCH
670 000 FEET
680 000 FEET
1 160 000 FEET
1 355 000 FEET
N
1 MILE
1 KILOMETER
Scale 1:15 840
27
28
26
25
33
34
35
36


N
MILE
KILOMETER
0
1/4
1/2
3/4
1
0
0.5
1
R. 13 E.
R. 14 E.
(Joins sheet 30)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 38)
T. 26 N.
700 000 FEET
685 000 FEET
1 160 000 FEET
1 155 000 FEET
25
28
29
30
31
32
33
36
MONROE
BERNE
HABEGGER DITCH
WITTMER NO. 1
BcA
BcB
Pm
GoB
HaA
Mh
MoC2
McB
RdB
Ud
Wh


N
(Joins sheet 31)
R. 14 E.
R. 15 E.
T. 26 N.
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 39)
705 000 FEET
720 000 FEET
M O N R O E
B L U E
C R E E K
26
25
30
27
34
35
36
31
water
HABEGGER DITCH
SHOEMAKER DITCH
FARLOW DITCH
GATES DITCH
SMITH DITCH
SPRUNGER DITCH
1 MILE
1 KILOMETER
Scale 1:15 840

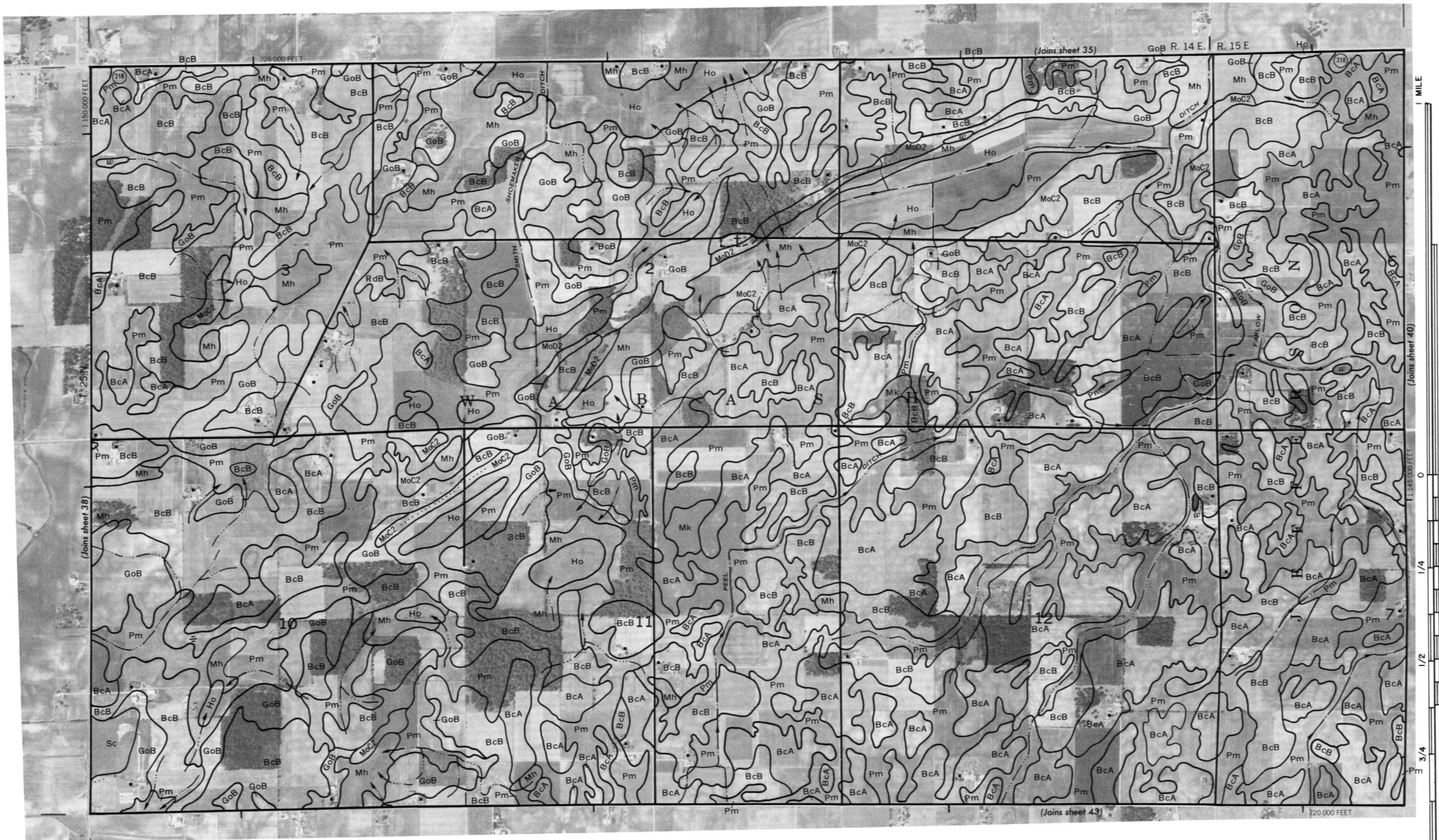

N
MILE
KILOMETER
0
1/4
1/2
3/4
1
0
0.5
1
(Joins sheet 32)
(Joins sheet 35)
(Joins sheet 40)
R. 15 E.
T. 26 N.
735 000 FEET
725 000 FEET
1 155 000 FEET
1 160 000 FEET
MERCER COUNTY, OHIO
B L U E C R E E K
Little Blue Creek
Blue Creek
30
29
28
27
31
32
33
34
218


N
(Joins sheet 33)
R. 13 E.
670 000 FEET
T. 25 N
WELLS COUNTY
1 145 000 FEET
HARTFORD
Linn Grove
WABASH RIVER
SHOEMAKER DITCH
RICE DITCH
Threemile Creek
ANDERSON DITCH
(Joins sheet 38)
1 140 000 FEET
680 000 FEET
(Joins sheet 41)
1 MILE
1 KILOMETER
Scale 1:15 840

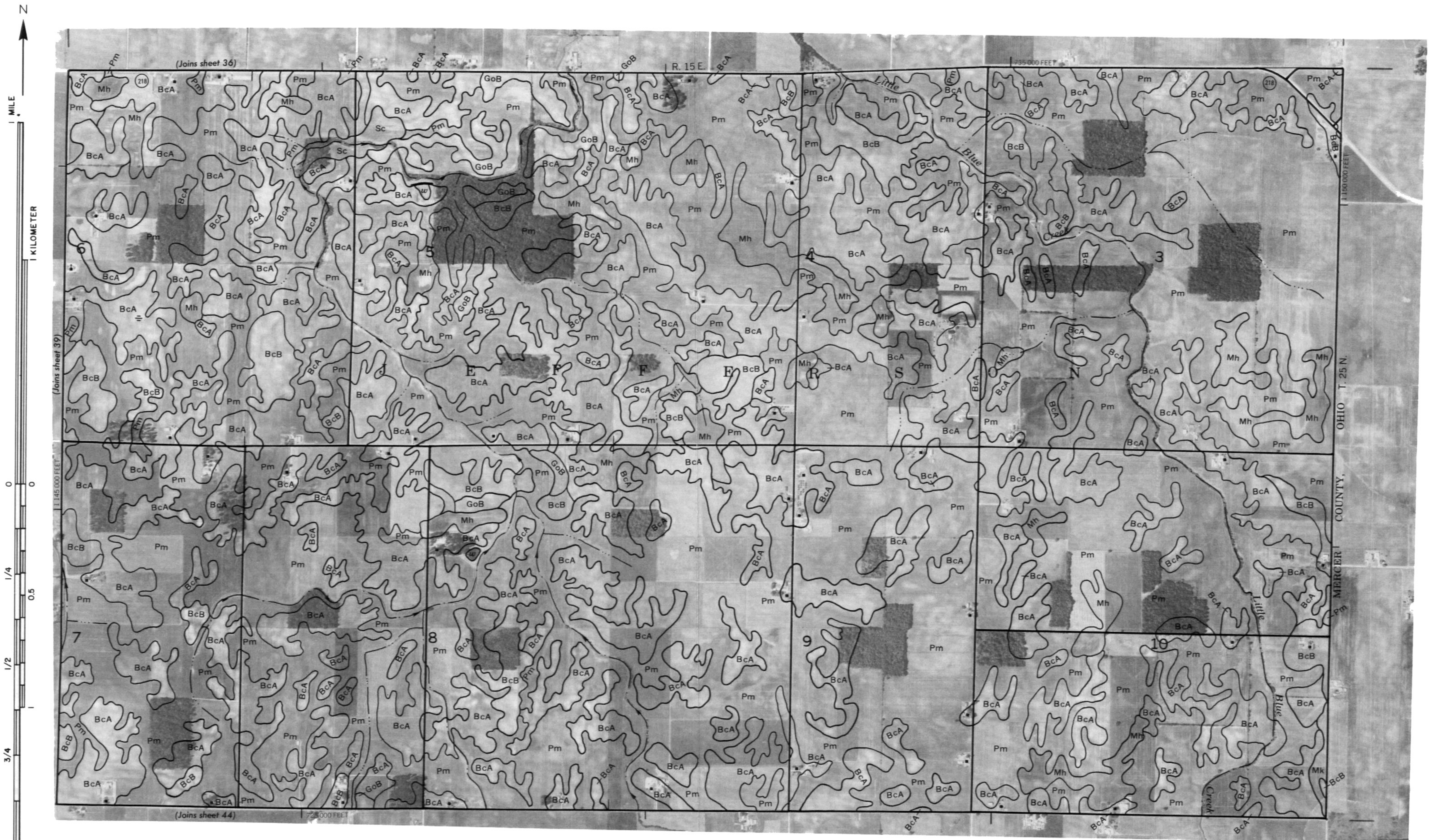

N
MILE
KILOMETER
0
1/4
1/2
3/4
1
0
0.5
1
R. 13 E.
R. 14 E.
(Joins sheet 34)
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 42)
T. 25 N.
700 000 FEET
1 150 000 FEET
1 140 000 FEET
685 000 FEET
BERNE
SHOEMAKER
DITCH
JAMSTUTZ
DITCH
WABASH
water
218
27
BcA
BcB
GoB
Pm
Mh
Wh
McB
MoC2
RdB
Ud
HaA
Sc
Tc
Ho
w
1
4
5
6
7
8
9
12

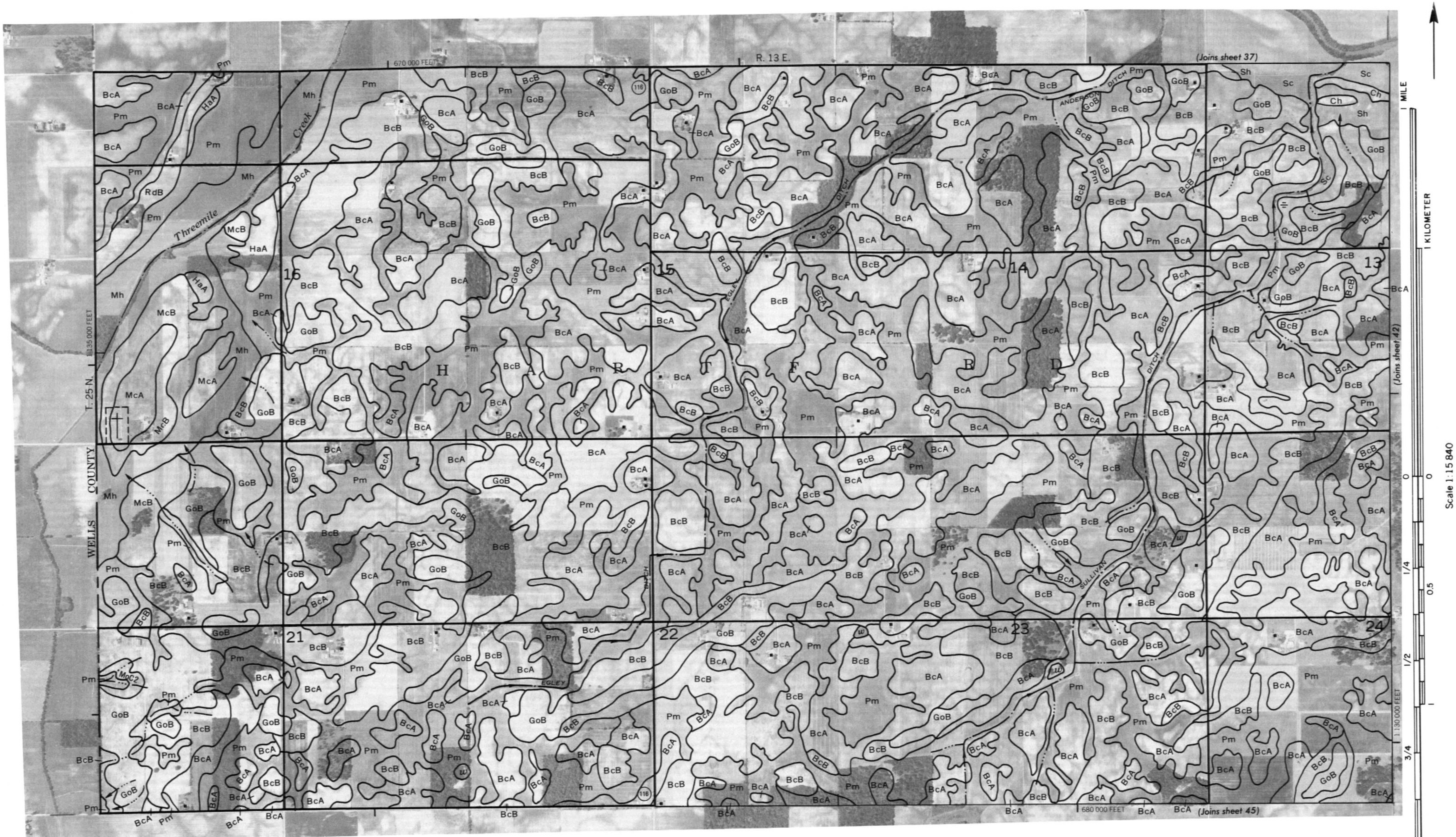
ADAMS COUNTY, INDIANA — SHEET NUMBER 39

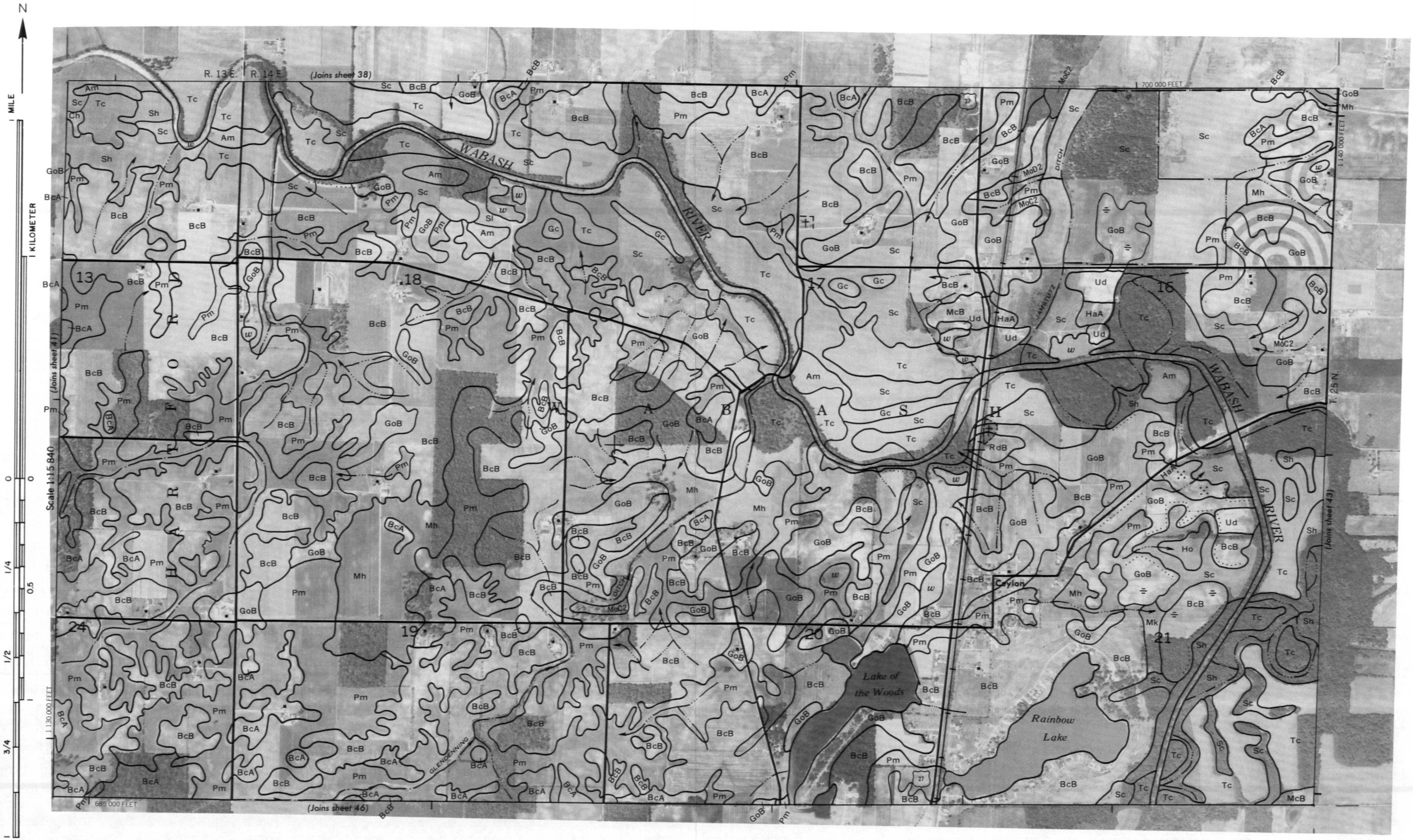
N

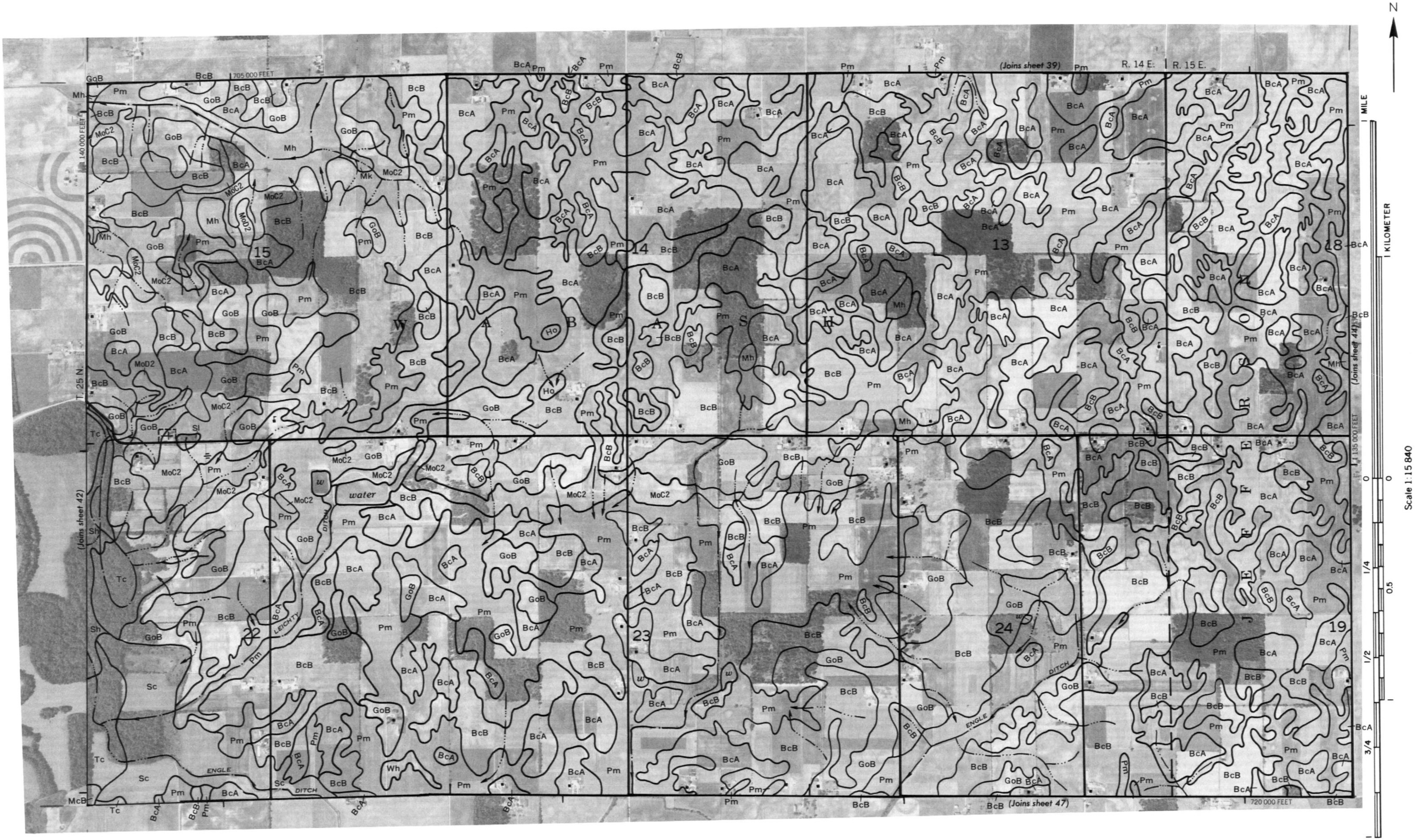


Scale 1:15 840


N
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
1
0
0.5
1
(Joins sheet 36)
(Joins sheet 39)
(Joins sheet 44)
R. 15 E.
735 000 FEET
1 145 000 FEET
1 150 000 FEET
T. 25 N.
MERCER COUNTY, OHIO
J E F F E R S O N
Little Blue Creek
218


N
R. 13 E.
670 000 FEET
(Joins sheet 37)
(Joins sheet 42)
(Joins sheet 45)
680 000 FEET
135 000 FEET
1 130 000 FEET
T. 25 N.
WELLS COUNTY
Threemile
Creek
ANDERSON DITCH
EGLEY DITCH
SULLIVAN
DITCH
H A R T F O R D
16
15
14
13
21
22
23
24
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840


N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
1
0
0.5
R. 13 E.
R. 14 E.
(Joins sheet 38)
(Joins sheet 41)
(Joins sheet 43)
(Joins sheet 46)
T. 25 N.
700 000 FEET
1 140 000 FEET
1 130 000 FEET
685 000 FEET
WABASH RIVER
HARTFORD
WABASH
JAMSTUTZ DITCH
DITCH
GLENDENNING
Lake of the Woods
Rainbow Lake
Ceylon
13
18
17
16
24
19
20
21
27


N
(Joins sheet 39)
(Joins sheet 42)
(Joins sheet 44)
(Joins sheet 47)
R. 14 E.
R. 15 E.
T. 25 N.
705 000 FEET
720 000 FEET
140 000 FEET
135 000 FEET
15
14
13
18
22
23
24
19
ENGLE
DITCH
LEICHTY
water
1 MILE
1 KILOMETER
Scale 1:15 840

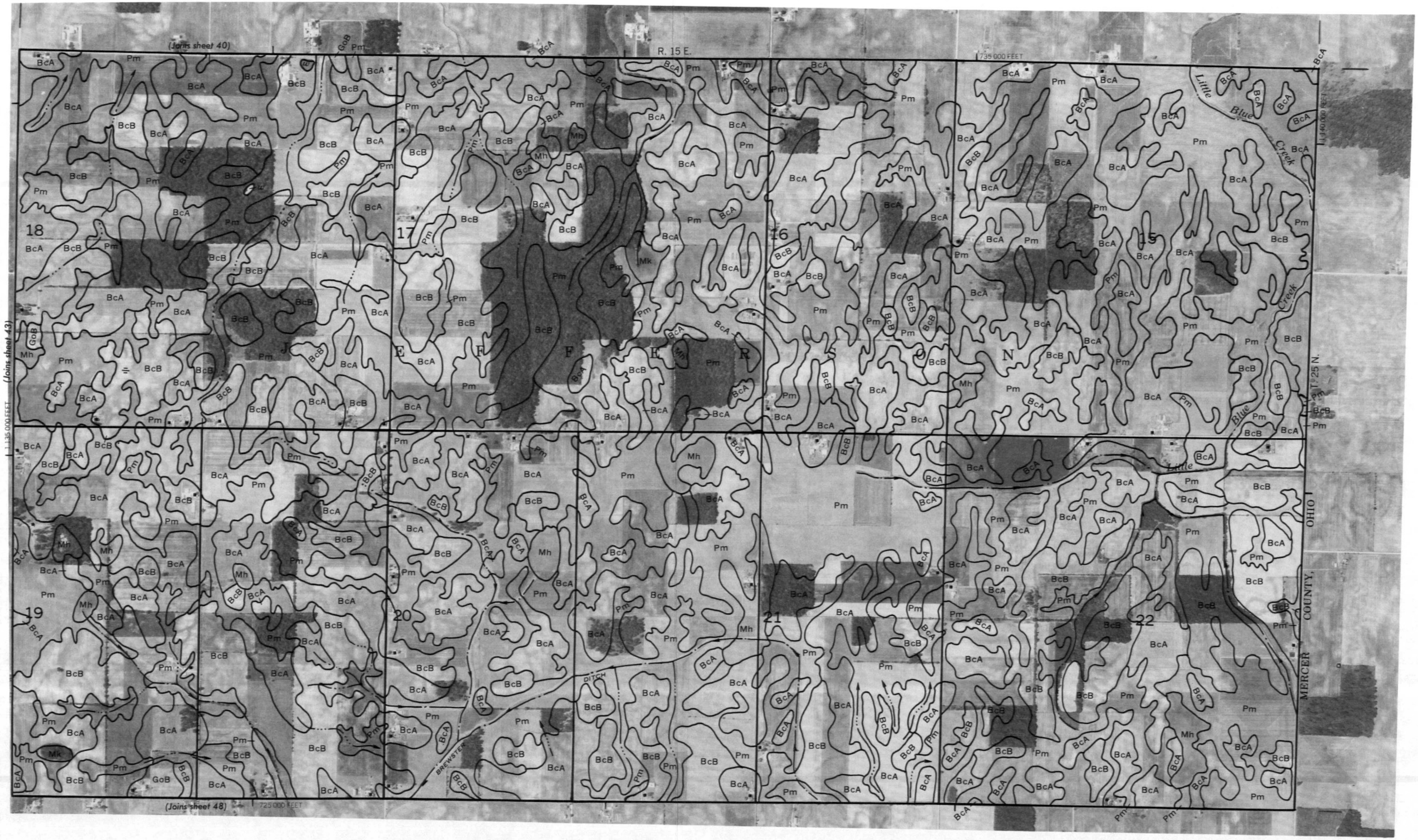
N

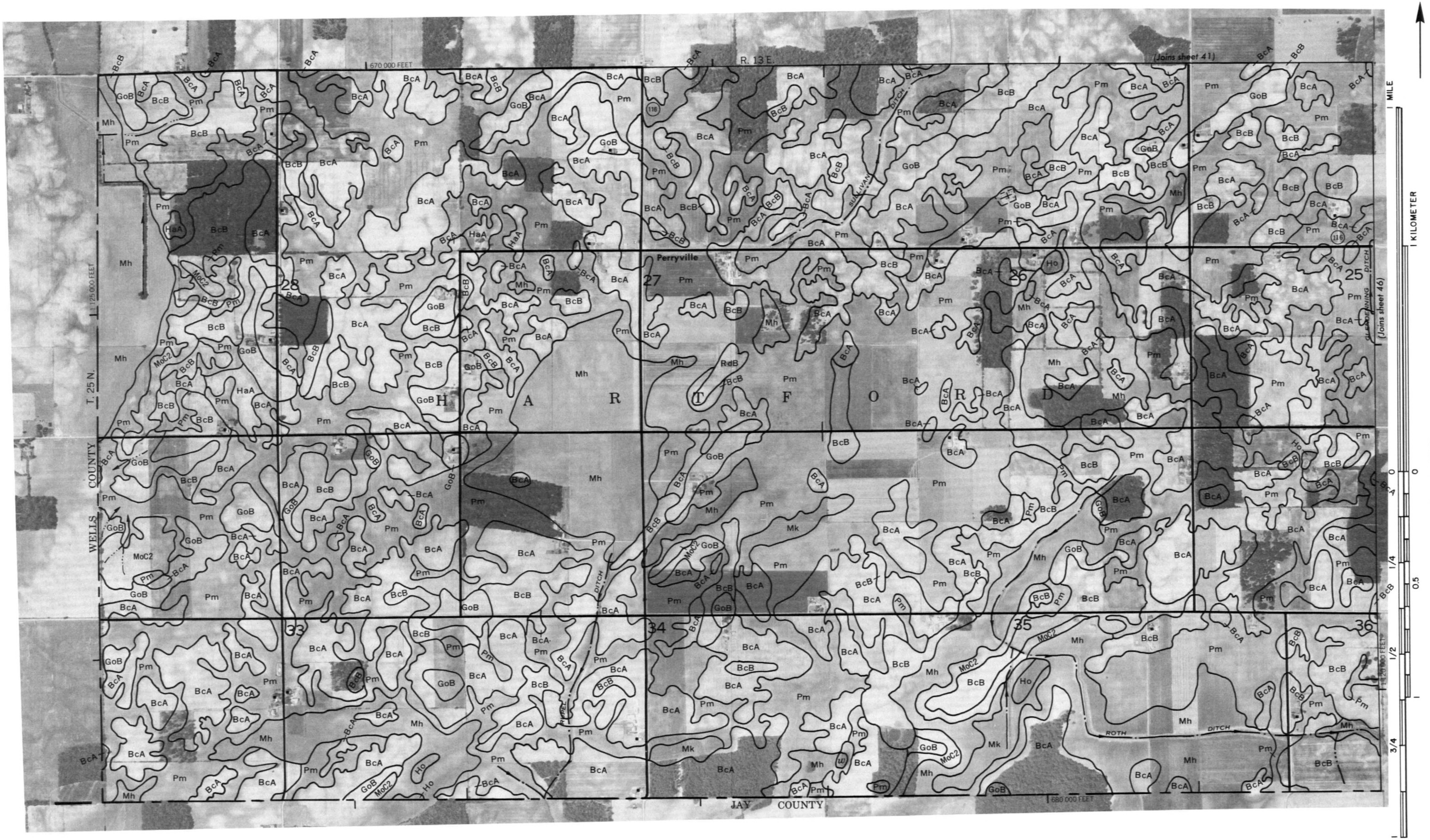
MILE

0 1/4 1/2 3/4 1

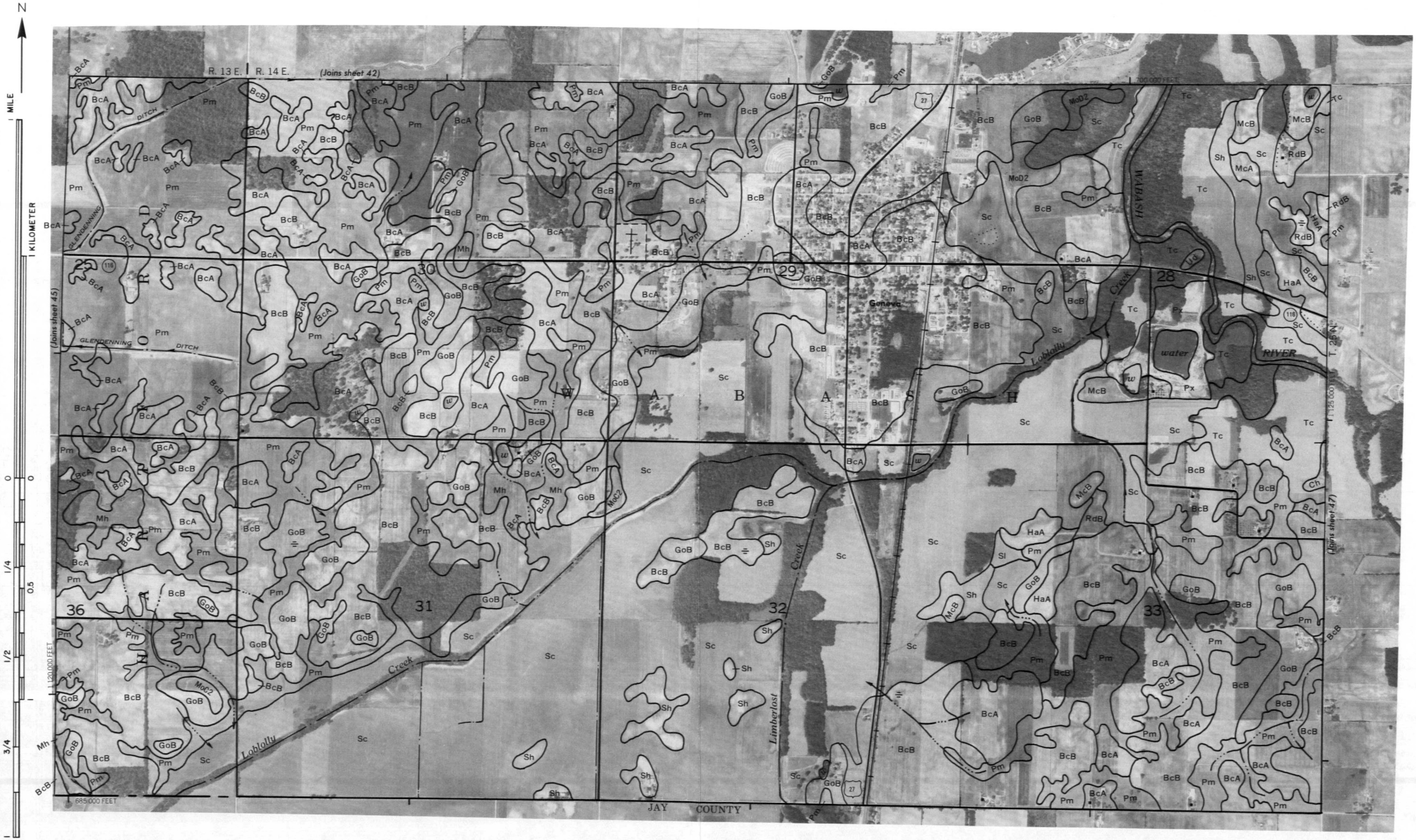
1 KILOMETER

0 0.5 1

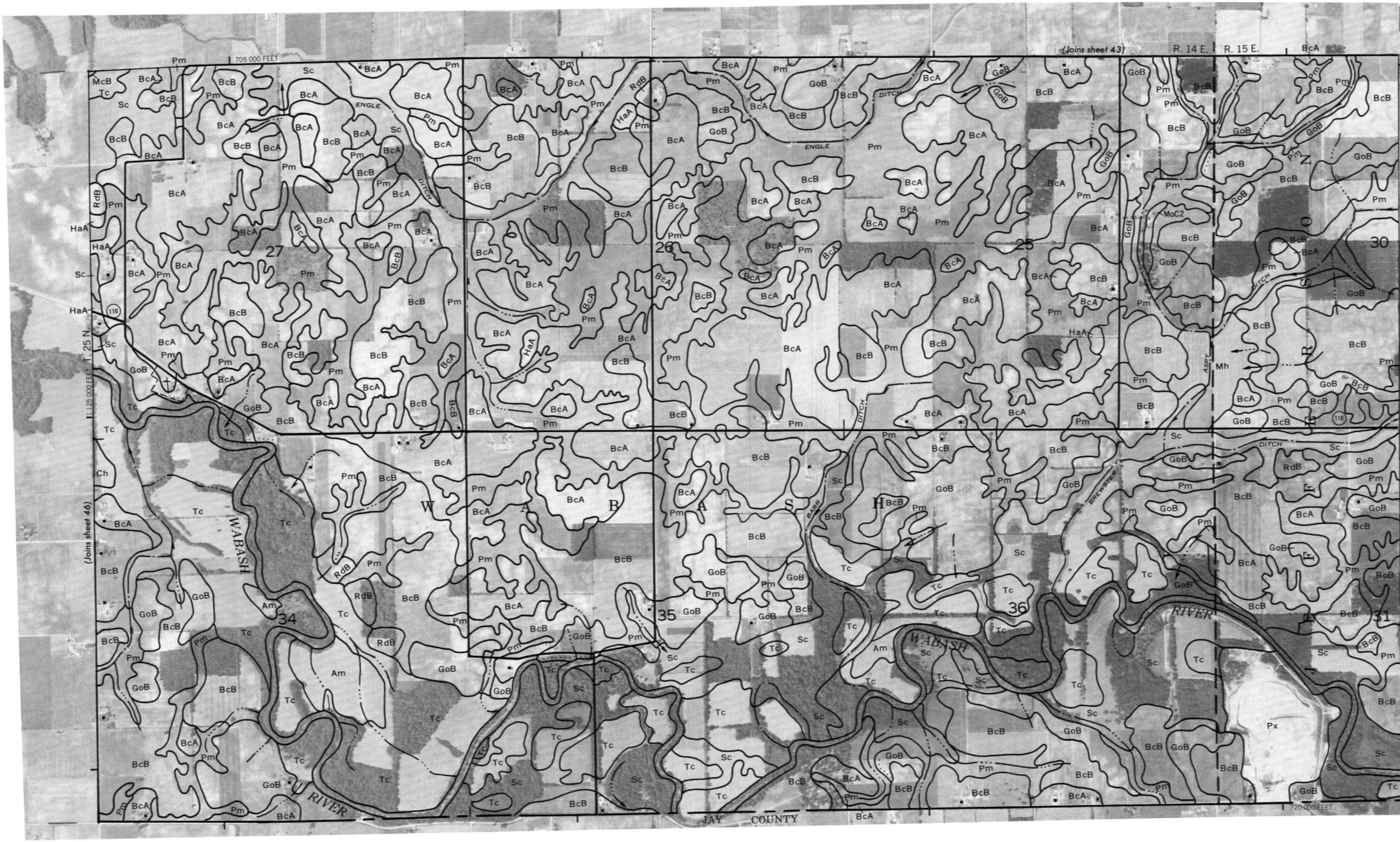




N
(Joins sheet 41)
(Joins sheet 46)
R. 13 E.
T. 25 N.
WELLS COUNTY
JAY COUNTY
Perryville
H A R T F O R D
670 000 FEET
680 000 FEET
125 000 FEET
SULLIVAN
ROTH DITCH
1 MILE
1 KILOMETER
Scale 1:15 840


N
MILE
KILOMETER
0
1/4
1/2
3/4
1
0.5
R. 13 E.
R. 14 E.
(Joins sheet 42)
(Joins sheet 45)
(Joins sheet 47)
GLENDENNING DITCH
Geneva
WABASH RIVER
Loblolly Creek
Limberlost Creek
T. 25 N.
JAY COUNTY
700 000 FEET
685 000 FEET
125 000 FEET
120 000 FEET
25
28
29
30
31
32
33
36
water

N



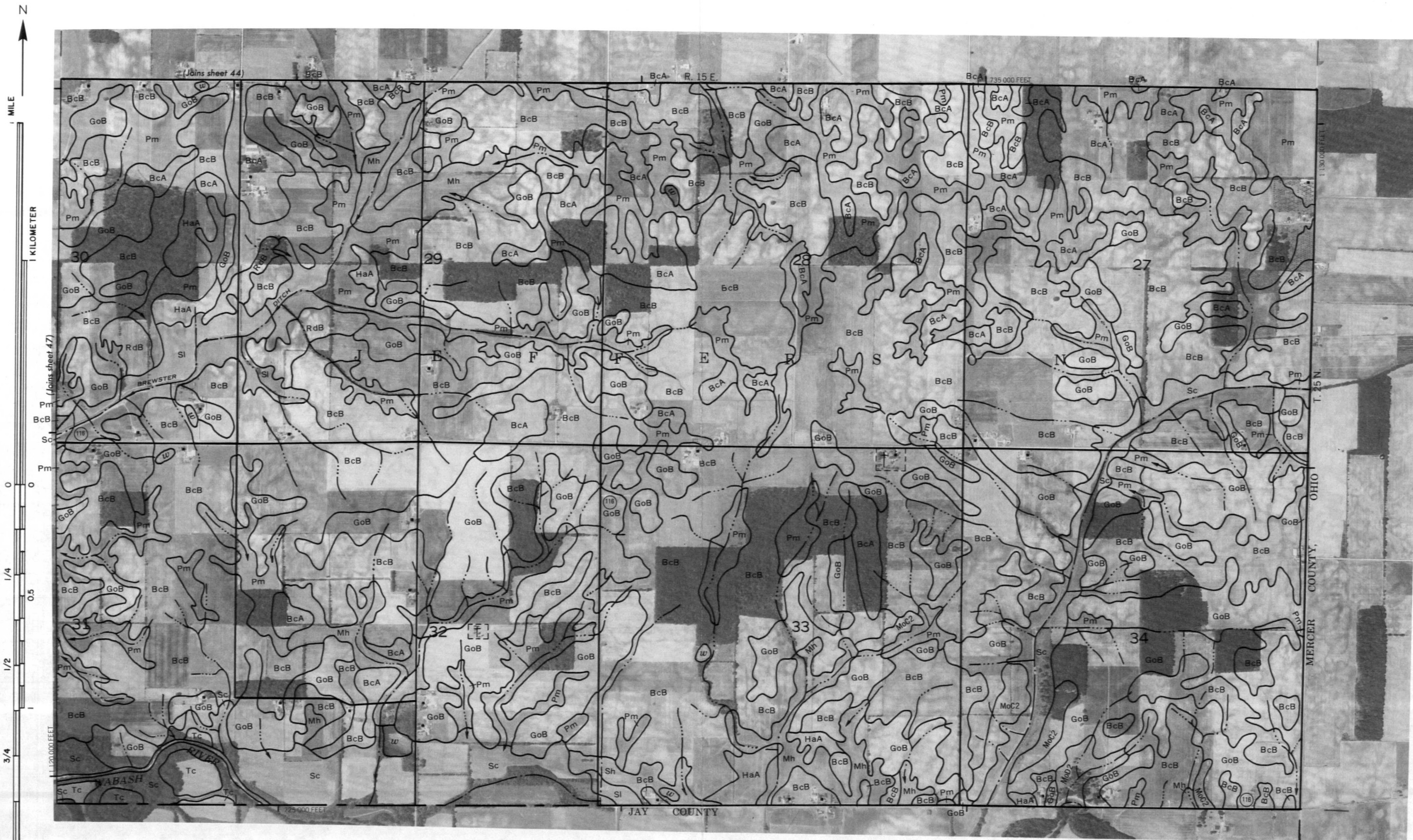
1 MILE

1 KILOMETER

0
1/4
1/2
3/4

0
0.5

Scale 1:15 840


N
MILE
0
1/4
1/2
3/4
1
KILOMETER
0
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1
(Joins sheet 44)
(Joins sheet 47)
R. 15 E.
735 000 FEET
1 130 000 FEET
1 120 000 FEET
725 000 FEET
T. 25 N.
J E F F E R S O N
30
29
28
27
31
32
33
34
BREWSTER
DITCH
WABASH
RIVER
JAY COUNTY
MERCER COUNTY, OHIO
116
BcA
BcB
GoB
Pm
Mh
HaA
RdB
Sl
Sc
Tc
Sh
MoC2
MoD2
w